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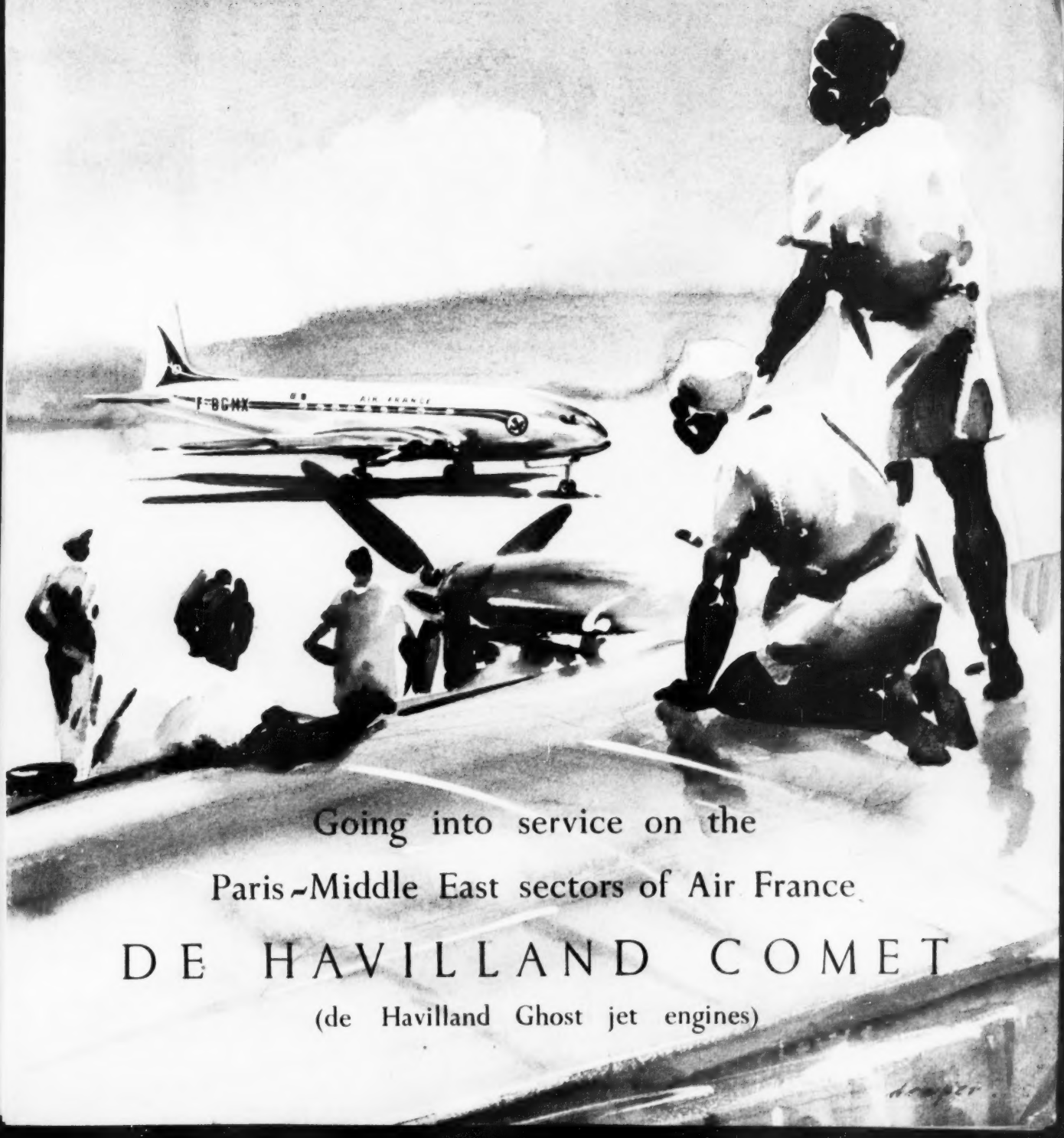

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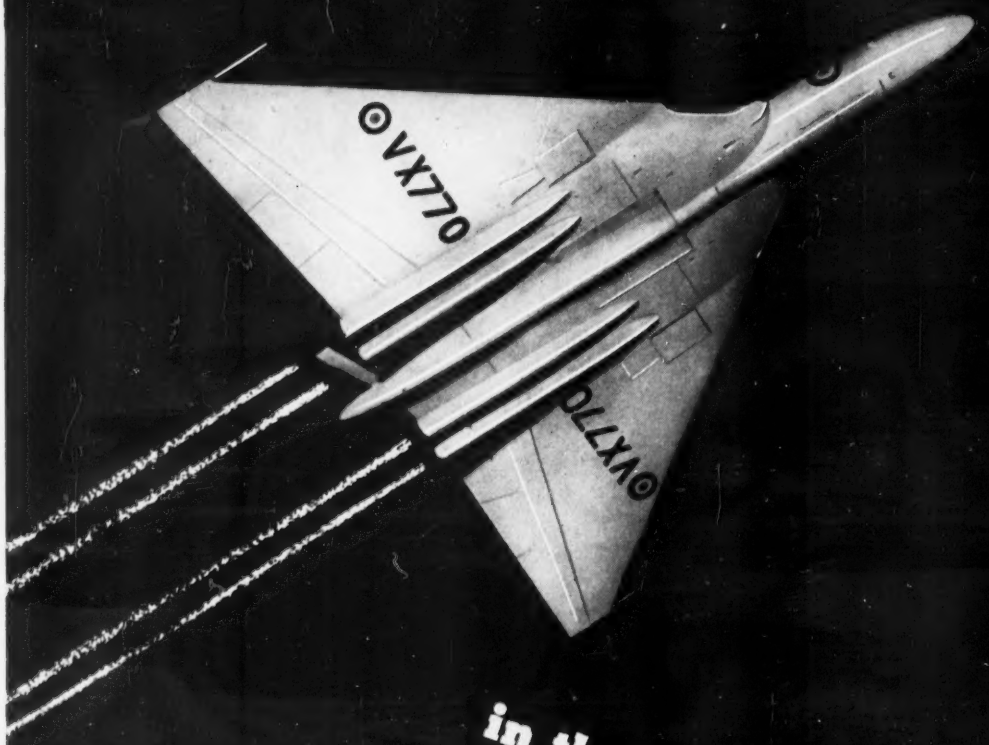

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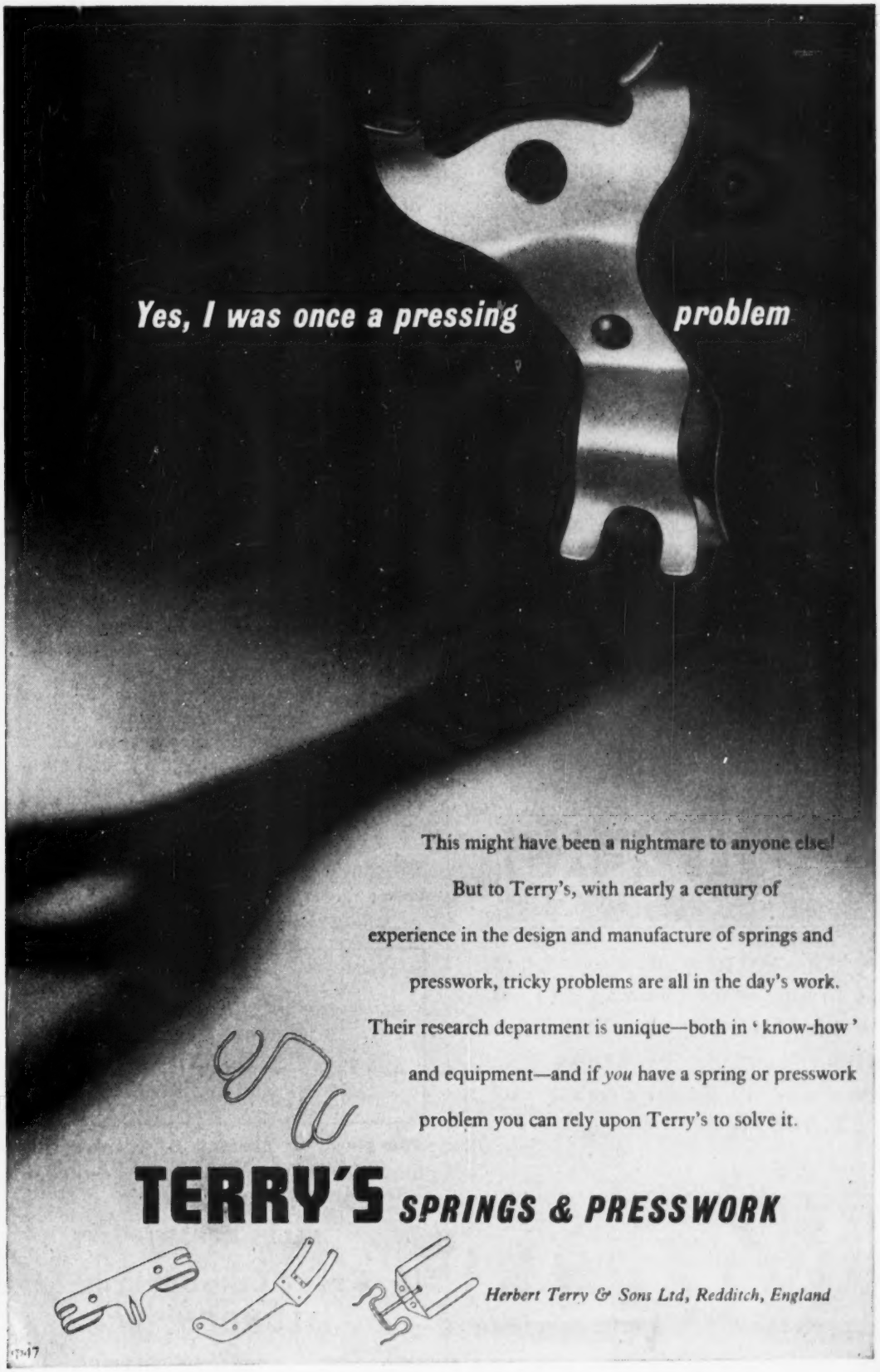
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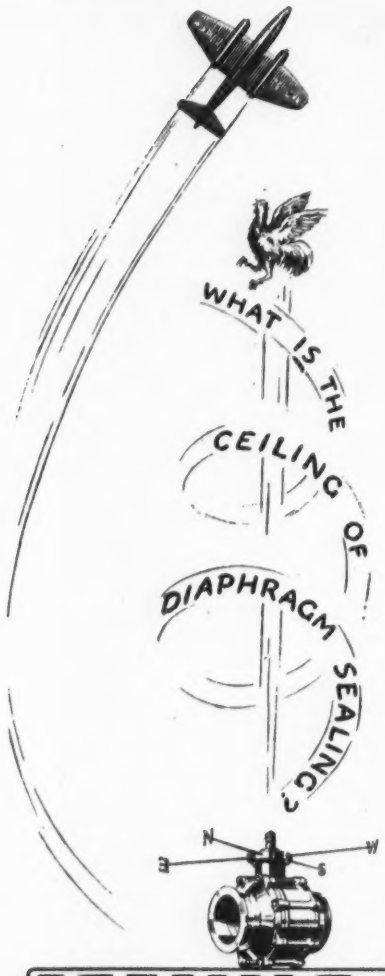

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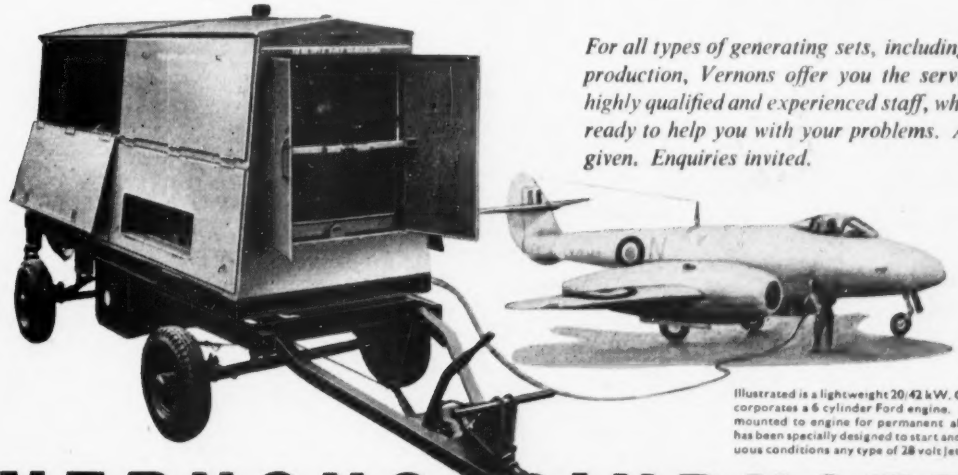

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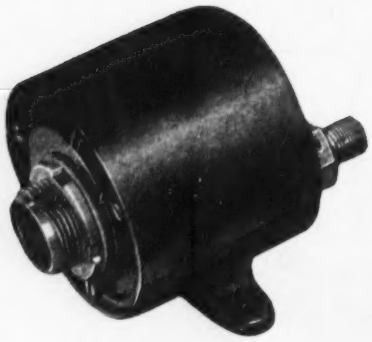

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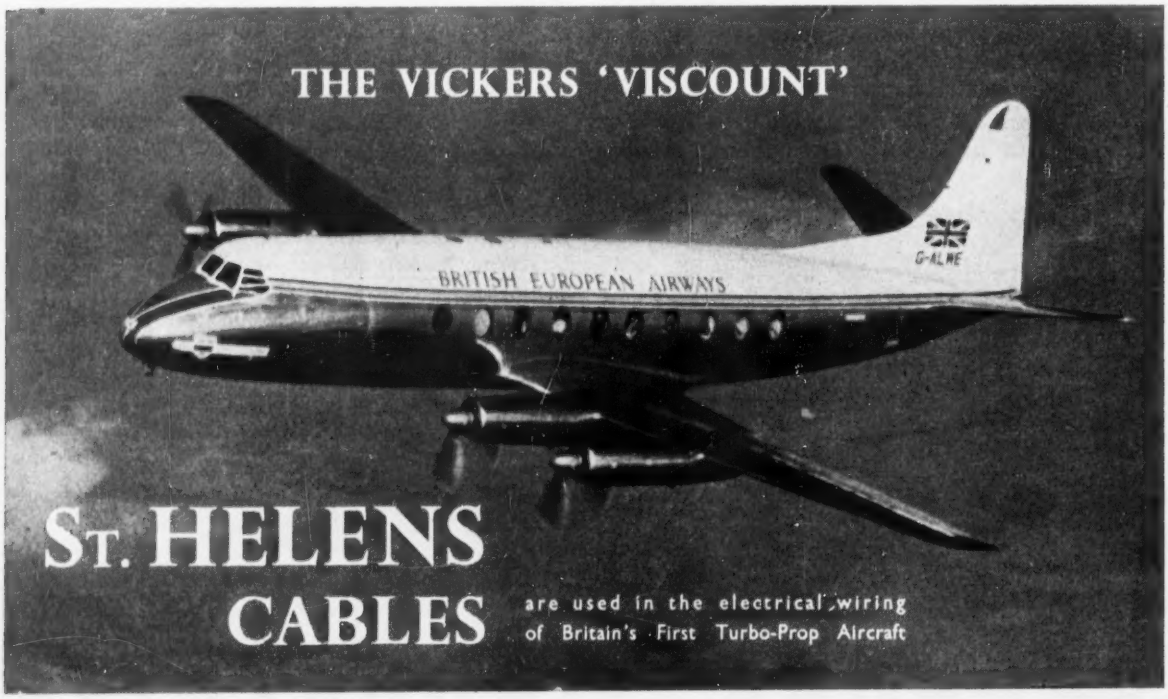
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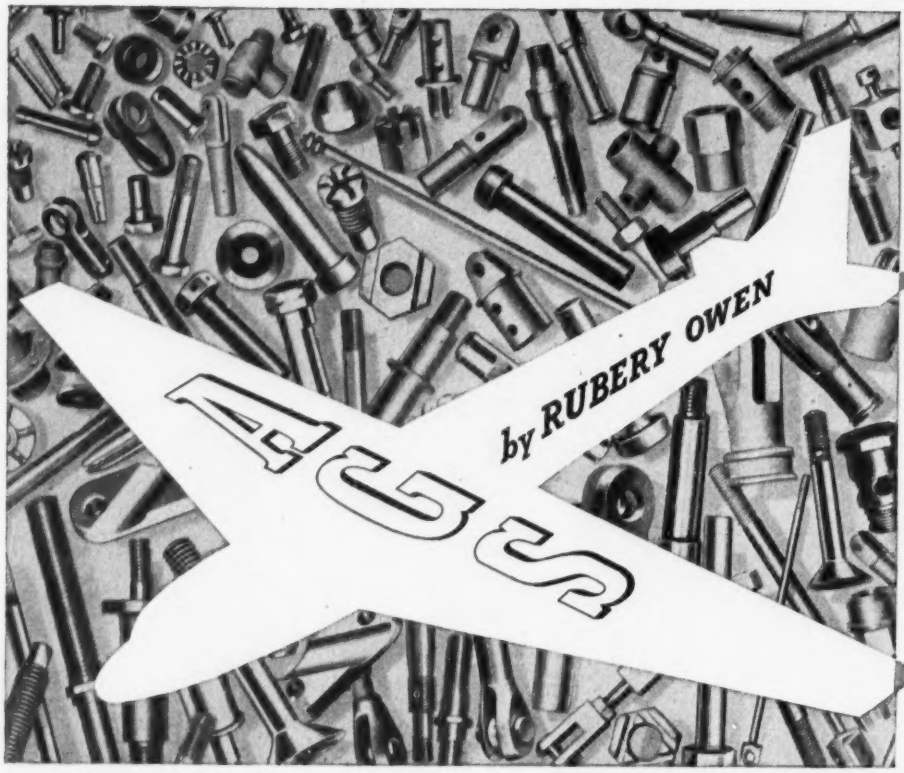

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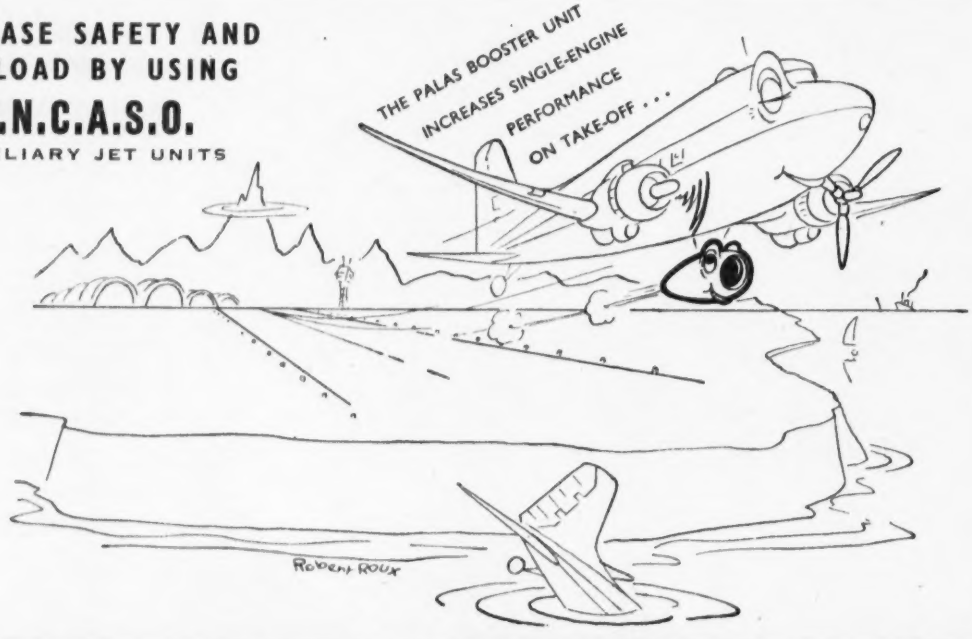

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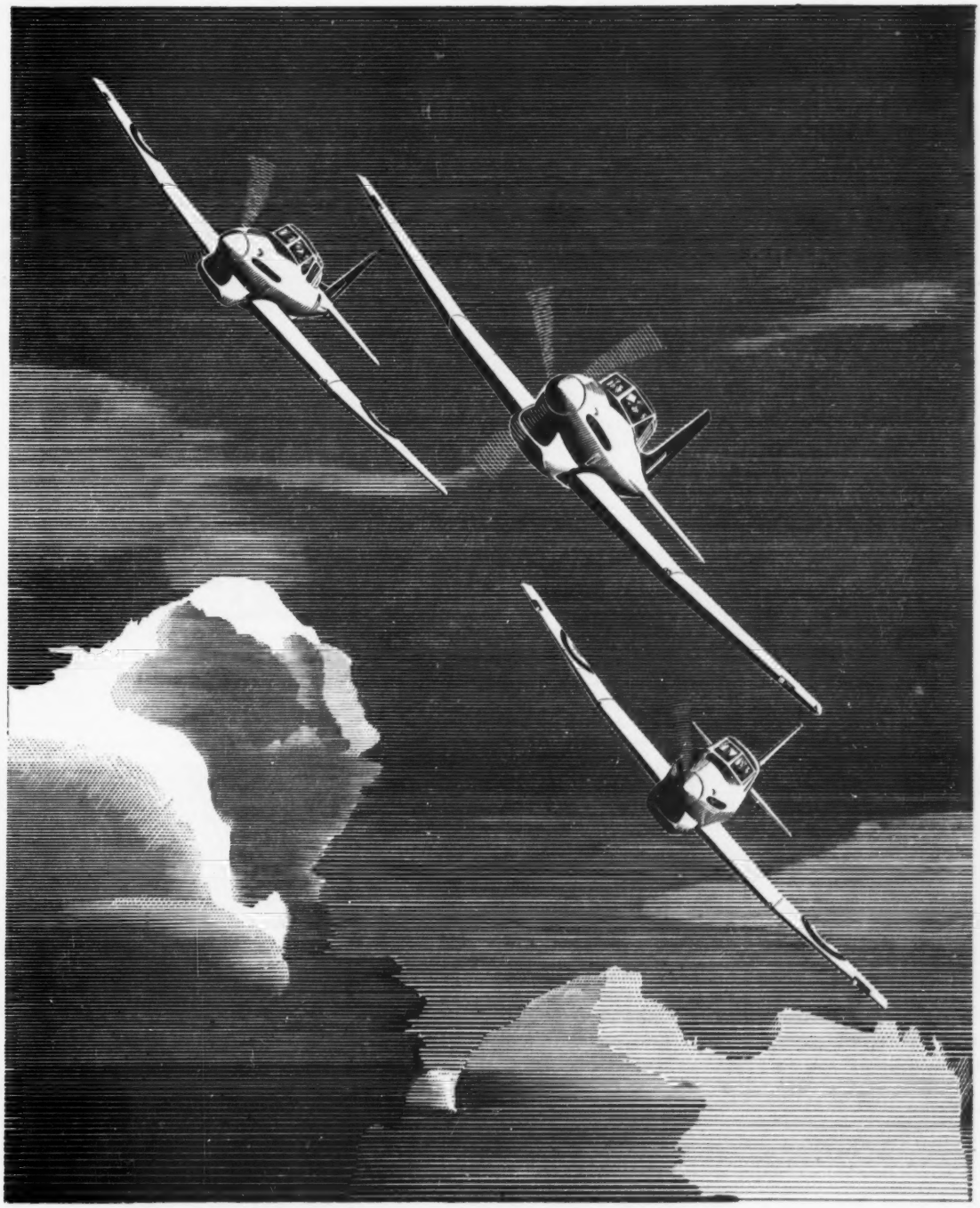

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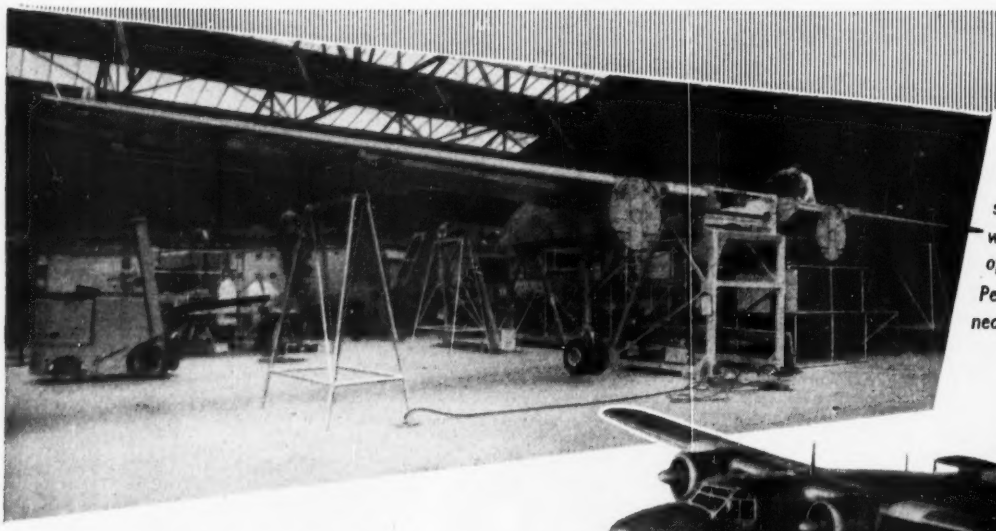
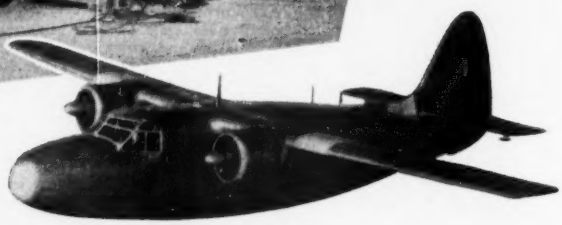


Our photograph shows a complete wing assembly of the Percival Pembroke nearing completion



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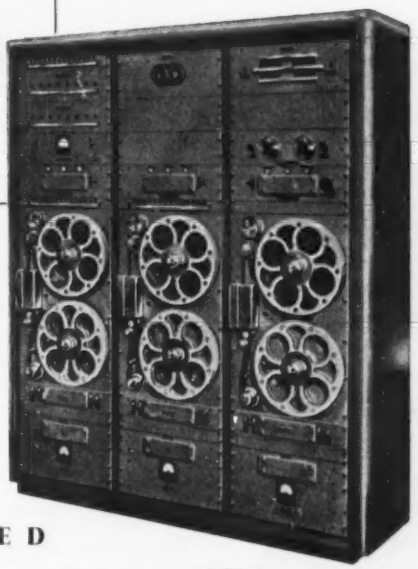

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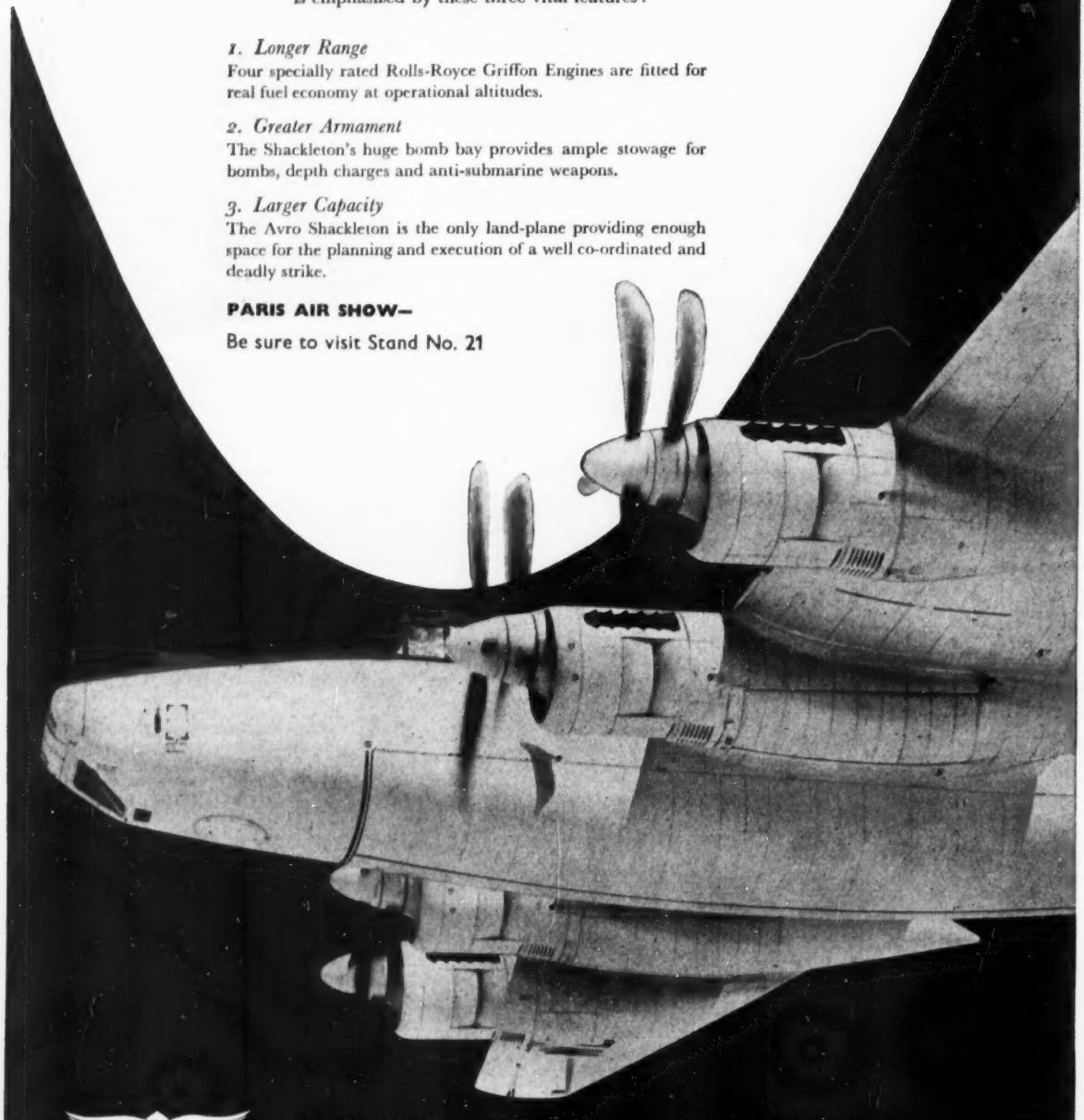

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Founded 1909

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IN THIS ISSUE:

R.A.A.F. in Britain - - - 2
Ramjet Possibilities - - 7
The Twentieth Salon - 15
The Sharp End (Part 3) - 23
Cranfield Presentation Day - - - - - - - 34

Impressions from Paris

THE Paris Show has never in all the years failed to produce something novel from the French industry, and thus for reasons of prestige and good will it continues on each occasion to draw strong British support in spite of the high cost, interruption of work, and comparatively limited additional business which may attend participation. There have been thin years for French aviation as there have been for the wines of the country, but this twentieth Salon must be accorded the four stars of a *très grande année* so far as the French manufacturers are concerned. On all sides there are indications of vitality and abundance of enterprise. As we record among our "first impressions" of the show, one example which may be quoted is that of the new exhibition building itself. It is attractive, convenient and well suited to its job. At home we have heard several reasons for not having such a building ourselves—and they are no doubt good ones—but the fact remains that the French have taken their decision and in a remarkably short time have erected a permanent modern aviation exhibition hall at Le Bourget airport.

Over the past year in particular, the French have demonstrated that they are no longer satisfied to mark their technical progress with a string of abandoned prototypes but are now ready and able to produce very good aircraft in series.

The prototypes are there too, of course, and what more widely differing approaches to a problem could there be than the Baroudeur and the Potez 75 for ground attack? Both indicate design courage. The same can be justifiably said of the rocket/jet prototypes to be flown this coming weekend; they will be the first to be demonstrated by any country on such a public occasion.

We are openly jealous of the light jet trainers—attractive and practical as they are—and hope that British companies have made a close examination of the Fouga 170 and the Fleuret, not forgetting the Minijet. This last-named machine, we recall, came in for some unflattering comments and mild ridicule when it was first displayed in semi-mock-up form two years ago. This time its almost daily demonstrations—looking and sounding like a diminutive Venom—are a main attraction of the Salon.

It is a source of wonder to us how French manufacturers, large and small, can continue to turn out light and ultra-light aircraft and to find quite a variety of small engines for them, while we have but one producer of light aircraft left and no engine smaller than the Cirrus Minor. Quite apart from the business aspects, this state of affairs must have a depressing effect on practical airmindedness which recent British gliding and glider successes can only in part offset.

And not only the industry of France is well represented; her national airline is there in strength and the varied equipment it was able to present for the French public in its thousands to gaze at and file through was, we feel, significant. What other airline can match a fleet comprising Comets, Viscounts, Super Constellations and Brèguet Deux Ponts? The aviation world is beginning to appreciate M. Brèguet's big transport.

But the exhibition is by no means all French, and in spite of an early show of no-interest by several firms, the British industry is worthily represented in both static and flying displays. Our descriptions elsewhere will make this apparent, and we have no doubt that the weekend's individual flying displays will forcefully demonstrate British progress and capabilities.

Finally, we must add that the Americans, whose participation has been slowly increasing, are this year present in strength, showing aircraft and new gas turbines, noteworthy among them the T-34 turboprop. This may be taken as an implied compliment to ourselves and to all Continental countries, indicating that this great aviation power has decided that it must look to its laurels in Europe.

We British certainly cannot afford to be complacent—nor are we, in spite of all the flattering talk about our lead in gas turbines and jet airliners. There is, however, just cause to be proud of our progress and achievements as they compare with those of any or all countries represented at Paris.

R.A.A.F. in BRITAIN

An Australian Fighter Wing for the Odiham Fly-past

TO represent the Commonwealth of Australia in Her Majesty's Review of her Air Forces at Odiham on July 15th, No 78 Fighter Wing, Royal Australian Air Force, is at present on detachment to Horsham St. Faith, near Norwich, where we recently visited them.

The Wing consists of two tactical squadrons, No. 75 and No. 76, equipped with Vampires; No. 478 maintenance squadron; and No. 378 base squadron. The entire Wing is designed to be self-supporting and unusually mobile, and is stated to be capable of operation from any unprepared airfield within 24 hours of the unit's arrival.

The personnel of the Wing left Australia by sea last year, to undertake a tour of duty in Malta. By doing so, they became the first Australian unit ever to undertake overseas garrison duty in peace-time. They arrived in Malta in July, and spent their first year overseas as lodgers at R.N.A.S. Hal Far (H.M.S. *Falcon*). There they found their aircraft waiting for them in the form of 16 Vampire F.B.9s and two Meteor T.7s; they had left their previous equipment of Nene-engined Vampire 31s in Australia. Their Vampire 9s were supplied new by the Royal Air Force, and are finished in silver with standard R.A.F. serials.

No. 78 Wing thus became in many ways a Royal Air Force unit, and operated in Malta as a unit of the R.A.F. Middle East Command. Notwithstanding the considerable experience of most of the Wing's pilots, a number were not jet-converted when they arrived in Malta, and to this end the Meteors put in some very good work. The squadron was fully operational by August of last year and since then has been extremely active throughout the whole Mediterranean area, having flown as a unit as far afield as Habbaniya in Iraq, and to much of the North African coast, including Tunis. A great deal of their exercising was done on an international basis, with several of the NATO nations, and in co-operation with the Royal Navy and U.S. 6th Fleet. Particularly startling results were obtained when they went to the armament practice camp at Nicosia, Cyprus, when air-to-air firing against Beaufighter-towed gliders proved unusually destructive to the latter. We learnt of two targets which were completely destroyed after the firing of 14 and 9 rounds of 20 mm. ball ammunition, respectively. The Wing also carried out a considerable amount of ground-attack work with both bombs and rockets.

"Flight" photograph

About to set out on a practice for formation leaders at Odiham are the Wing C.O., G/C. B. A. Eaton, D.S.O., D.F.C., and the C.O. of 76 Squadron, S/L. J. Adams, D.F.C., A.F.C.

On May 18th this year, 16 Vampires and the two Meteors flew to this country *via* Marseilles and Tangmere, in order to take part in the Royal Revjew. R.A.F. Transport Command flew across 114 ground staff—none of whom, we understand, had visited "the Old Country" before—together with specialist spares and pack-up tool kits. Transport Command also carried a number of wives and families of 78 Wing from Malta at the nominal charge of 5s. per head.

We found all the Australians at Horsham St. Faith unanimous in praise of all that the R.A.F. is doing to make them comfortable. They have been allotted a complete hangar with its associated workshops and offices, and are occupying permanent accommodation, the latter being a welcome change from the Nissen huts of Hal Far. The Australians also expressed themselves as very impressed by British operational procedures and radio aids, and also, it may be added, of the two Regular day-fighter Meteor squadrons whose airfield they share.

For the Odiham fly-past, 12 Vampires have been selected, and they will fly in three diamonds of four led by the commanding officer of the Wing, G/C. B. A. Eaton, D.S.O., D.F.C. There will be two airborne reserves, and both the Wing's Meteors will be in the static show on the airfield. The Wing has put in much practice flying for this memorable occasion, but has also undertaken a great deal of work of a more serious nature as a unit of the Eastern Sector of Fighter Command. The Australian Vampires have be-

"Flight" photograph

With a Vampire 9 are (back row, left to right) S/L. K. Andrews, P/O. V. Pennefather, P/O. J. Jacobs, P/O B. Weymouth, P/O V. Oborn, P/O. C. Sly, P/O. K. Meggs, D.F.M. (front row, l. to r.) F/L. S. Bradford, D.F.C., F/L. W. Horsman, D.F.C., F/L. "Blue" Thornton, D.F.M., A.F.M., F/O L. Reading, D.F.C., F/O. R. Hunt, D.F.C., and F/O. R. Jones.

haved both as "rats" and "terriers" and have exercised with Meteors, Venoms and Sabres. They are, we believe, the only Vampire day unit at present based in the British Isles.

Of the 18 pilots with the Wing in this country, 12 have completed a tour with the R.A.A.F. in Korea. Between them, they have experience of every phase of the Korean war, and have served with the renowned 77 Squadron, both when it was equipped with Mustangs and, more recently, with Meteors. Many, indeed, were the stirring tales that they had to tell of their work in that theatre. In particular, their frequent clashes with Mig 15s have made them exceptionally skilled air fighters, as their prowess in Cyprus clearly indicates. They spoke affectionately of their Vampires which, although lacking the power of the Nene-engined aircraft which they flew in Australia, are considered more pleasant to fly.

Certainly this Australian unit looks after its aircraft well, and the Vampires, as we saw them at Horsham, belied their average of 400-odd hours flying in all kinds of weather. The Mk 9 Vampire, it will be remembered, corresponds to the fighter-bomber Mk 5 with the addition of a Godfrey cold-air unit in the cabin air system. This refrigeration is blessed by the Australians just as it is by so many other Vampire and Venom pilots. Several of the aircraft were seen to have a white translucent Perspex panel above the nose; this, we were told, is the superficial evidence of a radio compass installation which has not yet been actually fitted. Standard fuel for the Vampires is AvTAG (wide-cut petrol) which is fairly certain to become the standard fighter fuel throughout the western world. Its use does, however, raise a whole set of complications and, in particular, we may quote several of the Australian officers as saying that the new fuel results in a 20 per cent loss in range—an unexpectedly high figure. But aircraft serviceability is satisfactory, lying between 70 and 80 per cent.

The Wing will leave this country towards the end of July, and hope to return to Malta by way of the Second T.A.F. in Germany, which should offer an instructive and picturesque trip. They will not return to Hal Far, but will fly straight to the R.A.F. airfield at Takali, to which the Wing's base squadron has already moved. Accommodation problems are less pressing at Takali than they are at Hal Far, and the Wing can, we hope, look forward to another successful year in the Mediterranean theatre.

SEABORNE HELICOPTERS

TWO Bell 47D helicopters are included in the complement of the Canadian Department of Transport's new ice-breaker, C.G.S. *d'Iberville*, which took part in the Coronation Naval Review at Spithead. The vessel is to return to Montreal early this month before leaving on her maiden trip to the Canadian Arctic.

The helicopter has been found a most valuable aid to navigation through the northern regions by the Canadian Arctic navigators. At present the C.G.S. *C. D. Howe*, which regularly visits many outposts in the Canadian Eastern Arctic, is equipped with one helicopter. The range of the new vessel is expected to be much greater than that of the *C. D. Howe*, and the *d'Iberville* was designed from the start to use two helicopters.

A heated hangar has been built in the aft end of the deck-house superstructure; it is equipped with a workshop, enabling minor repairs on the machines to be undertaken if required. Stocks of spare parts are also maintained aboard the ship. From experience gained aboard the *C. D. Howe*, civil aviation officers of the Department of Transport drew up their requirements for the hangar on the new vessel, and these were incorporated by the naval architects in the deck superstructure design.

The *d'Iberville* itself is thought to be the most powerful vessel of its kind and is equipped with the most modern navigation aids. It is intended to be operated in the far northern Canadian waters to service Arctic weather stations, ionosphere stations, and general posts, where meteorologists, radio technicians, scientists, the Royal Canadian Mounted Police and other Government officers live and carry out their duties.

A close-up of one of the "d'Iberville's" Bell helicopters alighting on the stern flight deck.

A general view of the new Canadian ice-breaker. The hangar which houses the two helicopters is seen at the fore end of the flight deck.

S.B.A.C. SHOW: THE 1953 PROGRAMME

A SIGN of the growing importance of commercial aviation is the S.B.A.C. decision, announced last week, that participation in the flying display on the final trade day of this year's Farnborough Exhibition (Thursday, September 10th) will be confined to civil aircraft. As in previous years there will be a flying display on each afternoon of the exhibition, which runs from September 7th-13th inclusive.

From Monday, September 7th, to Thursday, September 10th, inclusive, the public will not be admitted to the exhibition. On the Monday there will be a preview for technicians and the Press; Tuesday, Wednesday and Thursday will be guest days for those invited by the S.B.A.C. This year, as in 1952, the public will be admitted on the Friday as well as on the Saturday and Sunday. On these three days the gates will open at 10 a.m., flying will be from 3 p.m. and the gates will close at 7 p.m.

Advance tickets *for Friday only* can be obtained through Autoparks, Ltd., 1-31, Maclise Road, Olympia, London, W.14, or through agencies. Tickets for Saturday and Sunday (and for Friday) will be on sale at the gate. Prices of admission are:

	Public première (Friday, Sept. 11th)	Public days (Saturday, Sept. 12th and Sunday, Sept. 13th)
Adults	£1	5s
Children	10s	2s 6d
Private car	£1 parking fee only	£1 10s inclusive of all occupants
Motor coaches (single- or double-decker)	£2 parking fee only (parking inside ground)	10s parking fee only (coaches must be parked outside ground)
Motor cycles	5s parking fee only	2s 6d parking fee only
Pedal cycles	2s 6d parking fee only	1s parking fee only

NOTE.—Except in the case of private cars on the Saturday and Sunday, where the price includes occupants, the prices for vehicles are parking fees only, and admission to the display is extra.

FROM ALL QUARTERS

ONE FOR THE NAVY: Cdr. O. Hanley U.S.N., with Cdr. A. C. R. Duval, is greeted by Mr. H. M. Woodhams, Managing Director of Sir W. G. Armstrong Whitworth Aircraft Ltd. at Bitteswell airfield last Friday. The occasion was the handing over of the first off-shore Sea Hawk for allocation to the Royal Navy (see paragraph on page 6). Others in the photograph are Mr. V. H. Wilton, assistant director of aircraft production M.o.S., (left), Lt. Victor U.S.N., and beside him Mr. Petts, A.I.D. Midland Area.

Sale of Jets to Russia

A FURTHER episode in the controversy arising from the decision of the late Government to sell jet engines to Russia was heard on June 23rd, in an adjournment debate initiated by Mr. George Wigg (Labour, Dudley), who referred to a recent statement by the Minister of Supply that the sale of these engines undoubtedly had the effect of reducing by about two years Britain's lead in the development of such engines, compared with the progress in Russia.

Mr. R. A. W. Low, Parliamentary Secretary to the Ministry of Supply, said that it was estimated that in 1946 we had a lead of some five years over the Russians in the development of jet engines. As a result of the sale of 25 Nenes and 30 Derwents to Russia between 1946 and 1948, that position was very much changed. It was known that in July 1948, the Russians had a prototype of the Mig-15 using the Rolls-Royce Nene engine. By October of the following year, the Mig-15 had reached Russian fighter squadrons and an almost exact copy of the Nene engine was being produced in quantity.

Mr. Low deduced from the above that the five-year lead we had in 1946 had shrunk in 1949 to three years or less in this type of engine, although in the interval aircraft engines had been developed along other lines.

Delete Church, Read Stretton

THE major flying display in the north country referred to in the issue of June 19th is at Royal Naval Air Station Stretton, near Warrington, Lancs, and not Church Stretton, as stated. The date is July 25th, and strong Service and civil support is promised.

Fleet Street Rotorplane

REPORTERS and photographers of the *Evening Standard* will be the first in this country to use a helicopter for regular travel to and from selected assignments. Announcing its purchase of a Westland-Sikorsky S-51 (500 h.p. Alvis Leonides), the paper states that the helicopter will act "like a homing pigeon, bringing back the news and pictures with a speed unequalled by any other newspaper . . ." Although this paper will be the first in Britain to operate its own helicopter, at least one Japanese newspaper has regularly operated a Hiller 360 for several months in addition to several other aircraft.

Cutback Hits Canadair

APPROXIMATELY 1,500 employees are to be discharged by Canadair, Ltd., as a result of a recent reduction in the U.S.A.F. budget. Canadair were to have built 227 Beech T-36 twin-engined crew-trainers, valued at £35m, for the U.S.A.F., but this order was recently cancelled, as recorded in *Flight* of June 19th.

Race Accident Inquest

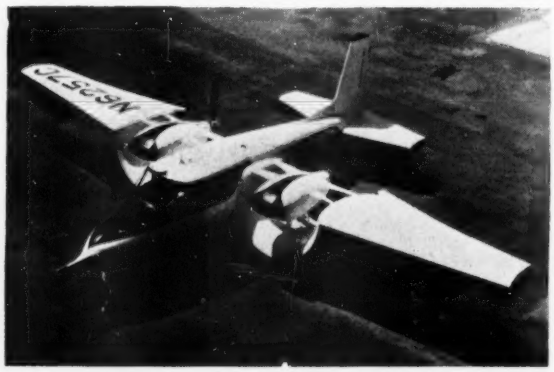
A VERDICT of Accidental Death was returned at the inquest, on June 26th, on Mr. John Crowther, who was killed while competing in the Kemsley Trophy Race. The jury added a rider stating that in their view the Royal Aero Club had done everything possible to make the race as safe as it could be.

S.L.A.E. Tenth A.G.M.

MANSION HOUSE in Portland Place, London, was the scene on Saturday, June 20th, of the tenth annual general meeting of the Society of Licensed Aircraft Engineers. Main items on the agenda were the presentation ceremonies in connection with the society's principle annual awards and the annual address to the society. The president of the society, N. A. H. Luke, A.R.Ae.S., M.S.L.A.E. was in the chair.

Recipient of the society's 1952 Gold Badge was R. E. Hardingham, C.M.G., O.B.E., F.R.Ae.S., M.S.L.A.E., secretary and chief executive of the Air Registration Board. The award was made to Mr. Hardingham for his notable paper "Some of the Responsibilities and Problems of an Airworthiness Authority," which was originally read before the S.L.A.E. as a main lecture in February 1952.

In the presence of Miss Pile, vice-president of the Women's Engineering Society, the author of the 1953 Dorothy Spicer



CCW-5, signifying Custer Channel-Wing 5-seater, is the designation of this unorthodox craft, concerning the possibilities of which there has been some controversy. It has been entered for the transport handicap section of the New Zealand Air Race. Mr. W. R. Custer, president of the Custer Channel Wing Corporation, who have built the aircraft, informs us that the first test flights should take place almost immediately.

IRAQI TRIO: Recent in-transit visitors to Nicosia, Cyprus, were these three Fury trainers bound for the Royal Iraqi Air Force.

TRANSATLANTIC TIME KEEPER: Mr. Peter Gluckmann, a San Francisco watchmaker, with the Luscomb 8-F in which he flew from that city across the U.S.A. and the Atlantic, arriving at Renfrew on June 26th. Refuelling stops on the crossing were made at Goose Bay, Greenland (where bad weather grounded the aircraft for nine days) and Iceland. The complete journey took three weeks.

Memorial Prize Essay, Mr. R. H. Nettell, then received his award. Delivering the 1953 Address to the society, Mr. J. D. Profumo, M.P., O.B.E., Parliamentary Secretary to the Ministry of Civil Aviation, reviewed the progress of civil aviation in relation to the work of the society in particular and to aircraft maintenance engineering generally.

In Parliament

MR. DUNCAN SANDYS, Minister of Supply, informed the House of Commons on June 29th that he was at present considering whether any change should be made in the proportion of civilian and Service test pilots employed in Ministry of Supply Establishments.

Mr. B. Janner (Lab., Leicester N.W.) asked the Minister to keep in mind that those pilots hitherto employed were engaged in a very risky occupation with a high death rate, and that merely for the sake of economy he should not discharge people who had rendered very considerable service to the country. Mr. Sandys welcomed the opportunity to say publicly that he was very much aware of the fine record of skill and courage of both civilian and Service test pilots.

Answering another question, the Minister said that two types of twin-engined helicopter suitable for passenger service were being developed under Ministry of Supply contracts. One of these—the Bristol 173—had approached the stage when orders could be placed. He emphasized that the scale of production would depend upon the volume of orders received.

Ramsgate Reopened

BOMBED during the war, and recently reclaimed for flying purposes from agriculture, Ramsgate Airport was officially opened again by the Minister of Civil Aviation, Mr. A. T. Lennox-Boyd, on the afternoon of Saturday last, June 27th. Introduced by the Major of Ramsgate, Councillor E. G. Butcher, the Minister commented that no better year could have been chosen for the occasion than the 50th anniversary year of the first powered flight.

The flying display, organized by the airport operators Air Kruise, Ltd., and the Ramsgate Flying Club, followed the opening ceremony, and began with a spirited performance by members of the Popular Flying Association—G/C. Mole and Malcolm Macdonald in Dart Kittens and Geoffrey Allington in the Fairey Junior. A demonstration by D. B. Taylor in the prototype D.H. Heron was followed by an exhibition of what should and should not be done to a Tiger Moth by "instructor and pupil" from the Ramsgate Flying Club. An admirable demonstration of the Miles Aerovan's slow flying—and, in the stiff breeze, hovering—abilities was then given by Mr. L. Marmol, finishing with a perfectly judged dead-stick landing.

A display of air/ground rescue work by Capt. Kousy, U.S.A.F., in an S-55 helicopter—and of near-ground handling by a talented two-man ground crew—preceded the incomparable stall turns, rolls and inverted flying of the Patrouille d'Etampes, and a delayed parachute drop from an Auster by John Ralling, who landed some distance from the airport. The last items were "maggiebatics" by C. Nepean Bishop, formation aerobatics by a trio of Meteor 8s of 500 (County of Kent) Squadron, R.Aux.A.F., led by S/L. de Villiers, and a vigorous, noisy F-86E display by F/O. Villeneuve, R.C.A.F. Wing-tip vapour trails and a smoky jet streak streamed behind the Sabre as it tightly circled the airport, bringing to a close an excellent and varied flying display, accomplished in spite of increasingly unfriendly weather.

Paris Traffic Arrangements

DUE to the flying displays taking place at Le Bourget tomorrow (Saturday) and the following day, most of the services which normally use this Paris terminal will be transferred to Orly. Those passengers who are flying from Le Bourget are advised to use the airport buses rather than their own cars, since the roads will be extremely congested.

COMMERCIAL AVIATION ON TELEVISION

LAST Friday's edition of the television feature *Press Conference* was devoted to civil aviation matters, Sir Miles Thomas being the guest. The panel comprised Mr. D. Desoutter, Mr. E. Newman, Miss Goldring and Mr. Maurice Smith, Editor of *Flight*. From among the many informative, though of necessity brief, answers given by Sir Miles to the unrehearsed questions fired at him by the panel came the following information:

Air travel for the masses: Cheapness of fares would depend upon speed. The two things were conflicting: speed and economy had never gone hand in hand. *Future aircraft:* Sir Miles was much impressed by the economies offered by propeller-turbine aircraft. He looked forward to the Bristol Britannia, which would bring the benefits of air travel to a very large circle of people. *Comet economics:* The Comet 1 had demonstrated during the past 14 months that it was a paying aeroplane when it had a load factor of around 76 per cent. *Economic factors:* The amount of mail carried was a principal factor. Last year, due to import restrictions into Australia for commercial goods, B.O.A.C. mail revenue was £1 million lower than had been budgeted for. Air mail was cheap; business air mail was the important thing; personal air mail was immaterial.

Freight: Freight was inelastic. There was a certain limited amount of freight that was worth while carrying—fashion goods, perishable edibles. Air freight would continue, but it was a marginal kind of business to be in. B.O.A.C. tried to get as much money out of an aeroplane as possible on each of its trips. Twice as much was received for carrying a pound of passenger as a pound of freight. One British independent operator was thinking of running an all-freight service across the Atlantic. They had a licence, but that was about all. B.O.A.C. found that it was necessary to have some all-freight services to keep faith with customers who normally depended upon fill-up on passenger aircraft for freight carried. B.O.A.C. were having a good look at the economics of freighting over the Atlantic. *Delays on the ground:* One of the biggest benefits to air passengers would be a speed-up of ground handling; 125 miles of travel was now wasted for every quarter-hour on the ground. Fast underground trains on which Customs formalities could be dealt with would seem to be one of the answers to the problem of travelling to and from city air terminals.

Maximum speeds for commercial aircraft: Sir Miles's personal opinion was that we should come bang up against the sonic barrier, which was a definite demarcation of speed. "Tummy time" was not so much a problem when flying north and south as it was when flying east and west.

Limit to size of aircraft: If aeroplanes got too big you ran into problems of airport handling. *Flying-boats:* Sir Miles was very fond of the flying-boat. He would like to see the British Government invest several million pounds in combining two things: the flying-boat and the jet engine. The unfortunate fact was that so far flying-boats had been uneconomical because they were old-fashioned designs. By the time the Princess was built it was out of date technically. *Comet Airworthiness certificate in U.S.A.:* The Comet 3 did not exist, and it was for this that an Airworthiness certificate had been requested. *Rearward-facing seats:* Only in certain types of accidents did you get real benefit from backward-facing seats. Money could be far better spent on radio aids and other devices for preventing accidents and, asked Sir Miles, which way would you like the crew to face? *Careers in civil aviation:* This was a responsibility that B.O.A.C. acknowledged and accepted. The Corporation was taking in apprentices and training them for careers in civil aviation. The working life of a pilot was much longer than it used to be, and the piloting of civil aircraft was a career.

As the programme came to a close, Sir Miles Thomas was commenting on the possibilities of amalgamation between B.O.A.C. and B.E.A. He thought that certain departments, such as catering, might be combined with advantage.

HOLIDAY ISLAND: Madeira's popularity as a holiday resort ha
services operated between Southampton and Funchal, Madeira, by
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HERE AND TH

London-Paris Record Attempt

AN attempt on the late Trevor Wade's London-Paris speed record was due to be made on Wednesday by "Mike" Lithgow, flying an Avon-powered Vickers Supermarine Swift F.4 with re-heat. Weather permitting, the take-off was expected to be at 11 a.m. B.S.T., followed by a flying start from the west side of the airport at not less than 1,000ft. The existing record, set up in a Hawker P.1052 on May 13th, 1949, was 20 min 37.4 sec, giving a speed of 617.78 m.p.h.

Wedding Technique

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Round the World in 99 hr

"FABULOUS" was the description Mr. Horace Boren, of Texas, applied to the B.O.A.C. Comet trip which enabled him to set a new "passenger record" by flying round the world in 99 hr 16 min. The previous global-flight record of 118 hr 25 min was set by M. Jean-Marie Audibert last December. After crossing the Atlantic from New York, Mr. Boren flew from London to Tokyo by B.O.A.C. Comet and thence back to New York by North-west Airlines Stratocruiser, arriving on June 25th.

"Sound Barrier"

WE were recently asked how the term "sound barrier" was derived, and we are reminded by a reference to the matter in Avro Canada's house magazine, *Jet Age*. This recalls that Dr. W. F. Hilton, at present chief aerodynamicist of Sir W. G. Armstrong Whitworth Aircraft, Ltd., showed a group of reporters a graph of the horsepower required to propel an aircraft at higher and higher speeds. He indicated that as the speed of the aircraft approached the speed of sound a tremendous inc
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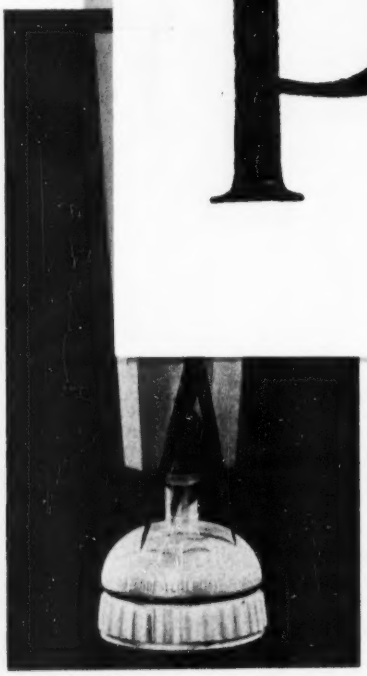

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presented by Lady Camm) at Langley on July 12th; the R.A.F. championships at St. Athan on July 26th; the International Radio Controlled Models Society's contests at Southend on the same day; and the world championships at Cranfield, under S.M.A.E. auspices, from August 1st to 3rd. Later are the St. Albans Club's All-Britain rally at Radlett (August 23rd) and the S.M.A.E.'s *Yorkshire Evening News* models festival at Sherburn-in-Elmet (September 6th).

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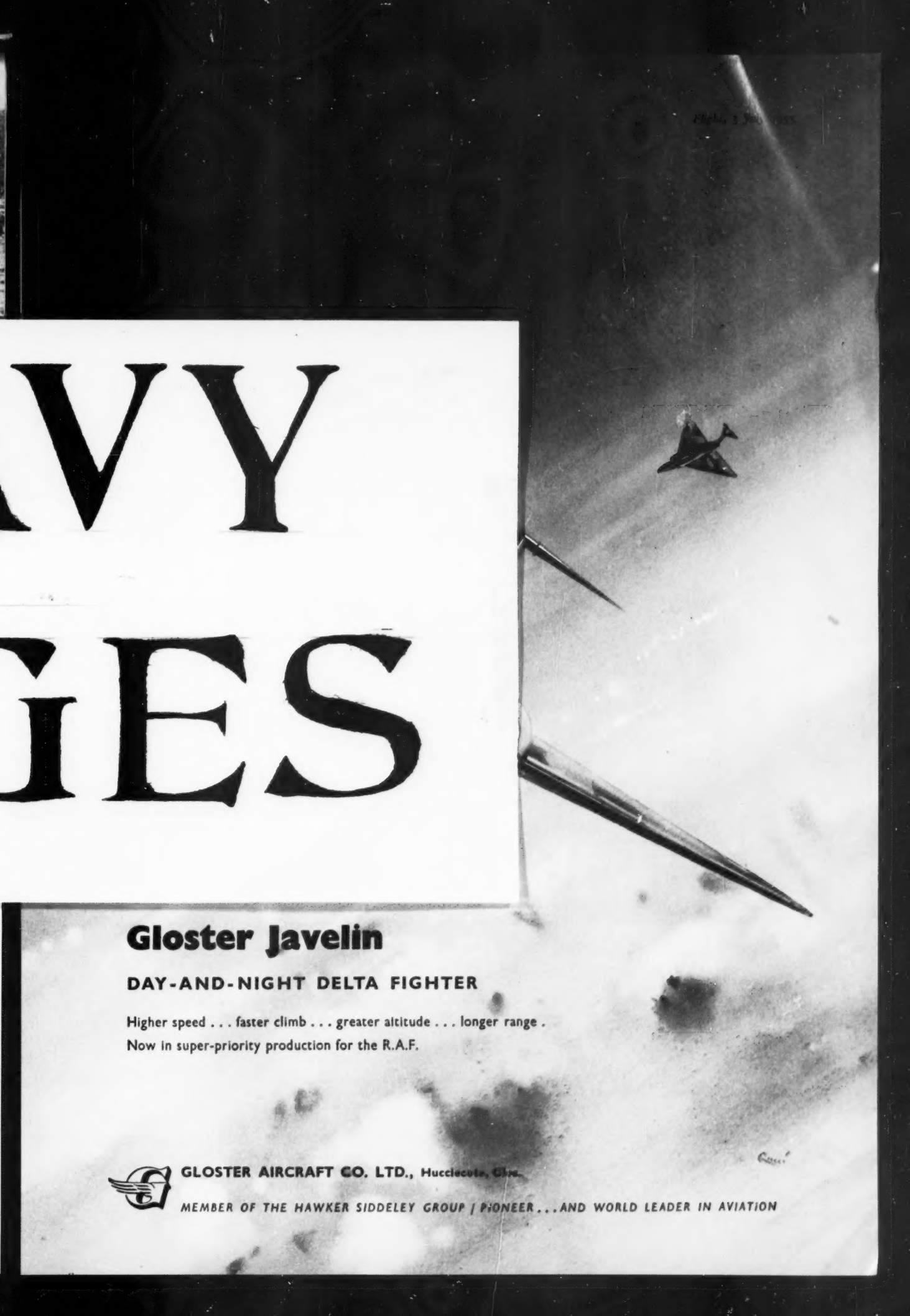
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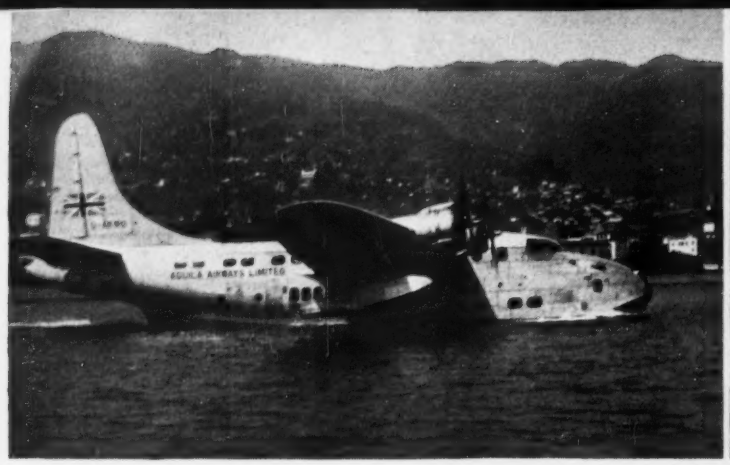

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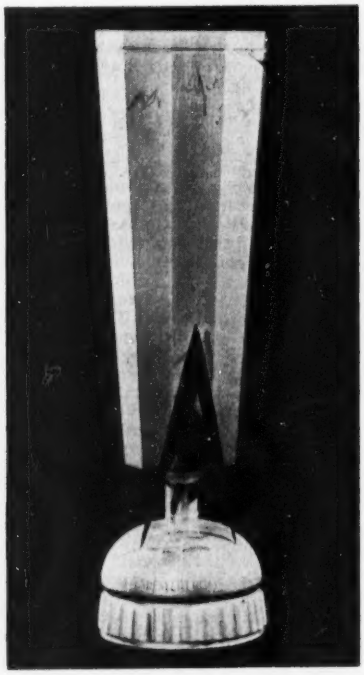
N.Z. Race Trophy

ILLUSTRATED below in wooden mock-up form, the Harewood Gold Cup (which will go to the winner of the speed section of the forthcoming New Zealand Race) is described by the Royal Aero Club as a "worthy trophy cup for such an event of our age." The cup itself is ten-sided, representing the ten decades of Canterbury's history, and is based on a hemisphere inscribed to show the two countries and the orbit path of the race. Design of the pedestal indicates the sea ("the Cup of Aviation being supreme over land and sea"), and dividers symbolically span the path of the race, forming a triangle signifying "measured precision in the sciences of Navigation, Surveying and Engineering which are epitomized in the race."



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First Off-shore Sea Hawk

AT Bitteswell last Friday, June 26th, the United States Navy accepted the first Hawker Sea Hawk to be built by Armstrong-Whitworth under a $13m off-shore contract. The aircraft was then transferred to the Fleet Air Arm, to which it has been allocated.

—and Off-shore Rockets

A CONTRACT for the production of rocket projectiles to the value of over £2 million is one of several recent off-shore procurement contracts awarded to Britain for the supply of ammunition to 17 NATO countries. These bring the total of off-shore procurement orders placed in this country to over £134 million for the fiscal year ending last month.

Proof of the Making

THE coming weeks promise to be busy ones for aeromodelling enthusiasts. Events scheduled include the Northern Heights Club's gala day (when the awards include that of the Queen Elizabeth Cup, to be presented by Lady Camm) at Langley on July 12th; the R.A.F. championships at St. Athan on July 26th; the International Radio Controlled Models Society's contests at Southend on the same day; and the world championships at Cranfield, under S.M.A.E. auspices, from August 1st to 3rd. Later are the St. Albans Club's All-Britain rally at Radlett (August 23rd) and the S.M.A.E.'s *Yorkshire Evening News* models festival at Sherburn-in-Elmet (September 6th).

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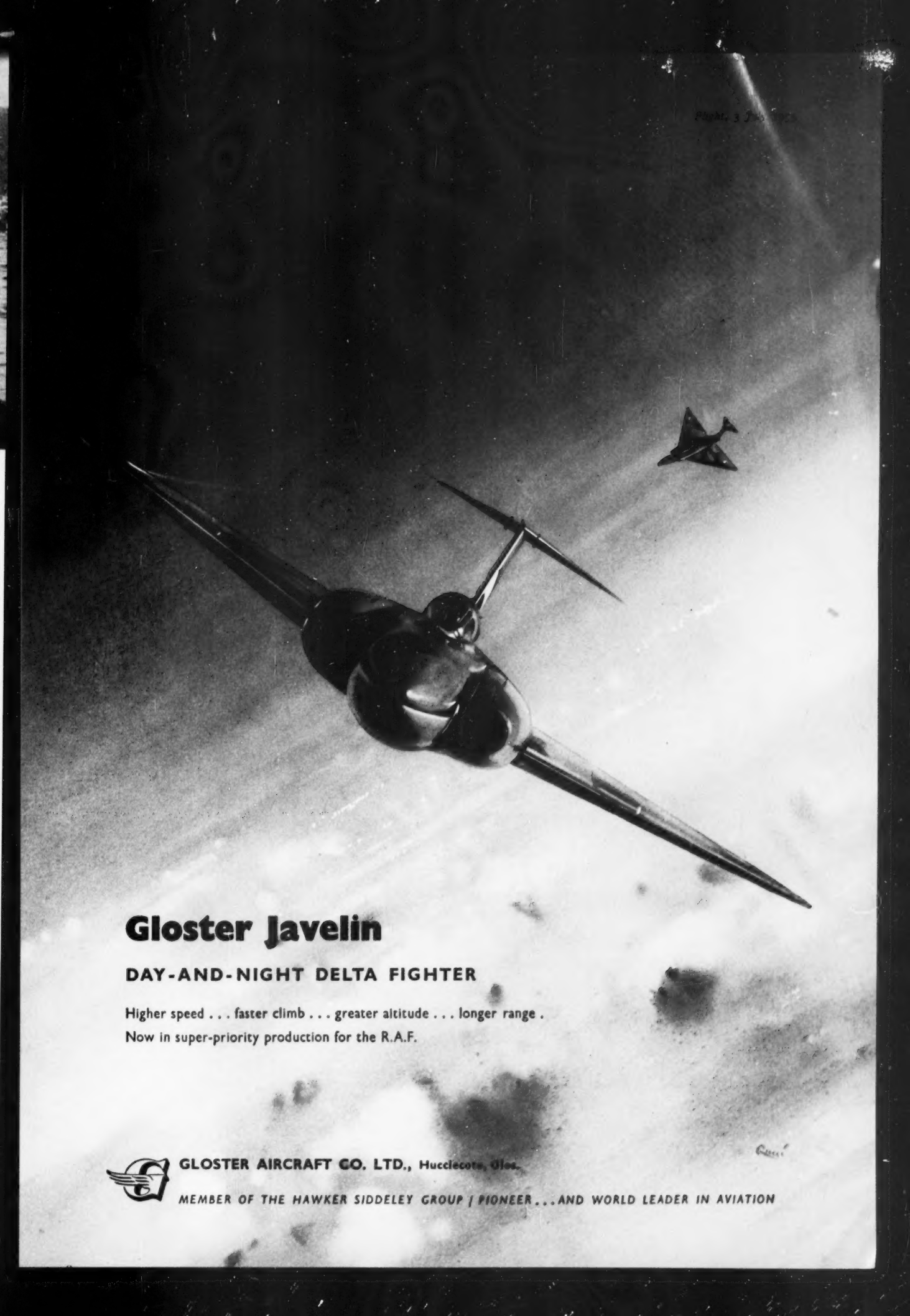

Gloster Javelin

DAY-AND-NIGHT DELTA FIGHTER

Higher speed . . . faster climb . . . greater altitude . . . longer range .
Now in super-priority production for the R.A.F.

GLOSTER AIRCRAFT CO. LTD., Hucclecote, Glos.

MEMBER OF THE HAWKER SIDDELEY GROUP / PIONEER . . . AND WORLD LEADER IN AVIATION

British Leadership in Design

This photograph, reproduced by kind courtesy of Handley Page Ltd., shows the new "Victor", the world's first crescent wing bomber.

Like many other leading Aircraft Manufacturers Handley Page Ltd. use Philidas nuts because:

- They are immovable except with a spanner.
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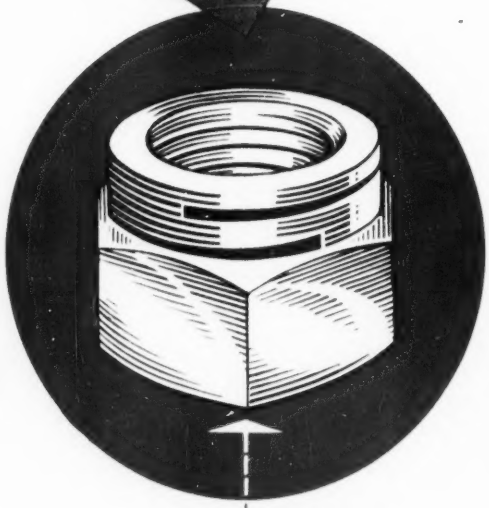
- They are manufactured entirely from metal in one piece, and in all the usual thread types.



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Man's first flight under purely ramjet power was accomplished in this Lockheed Shooting Star, with tip-mounted Marquardt units.

RAMJET POSSIBILITIES

Recent Developments and Future Promise Reviewed and Assessed

AS is well known, the ramjet—the simplest possible type of air-breathing propulsive unit—offers tempting advantages for aircraft and missiles with sufficiently high operating speeds. Although the system was proposed in theory as long ago as 1913 (by Lorin, in France) and was the subject of practical experiment by Mélot during and after the First World War, little more was heard until 1938, when René Leduc exhibited a model ramjet monoplane at the 1938 Paris Show; then there was a lapse of eight years until the Leduc O10, built by Bréguet, was successfully launched —though for a glide descent only—from a Languedoc airliner (November 1946). Some interim developments took place in Germany during the war, Walter reaching the model stage with various designs and Sänger actually flight-testing a 2,400 h.p. ramjet on a Do 17Z and a 20,000 h.p. unit on a Do 17E; Pabst also designed some efficient ramjets. The German Fi 103 (1944-45), the "V.1" of unpleasant memory, does not, strictly, come into the picture, for it was not a true ramjet, but a pulsejet or "stuttering athodyd." Most of the British work in the ramjet field has been veiled in secrecy, though a photograph of a model so propelled was released in 1946. At this time two well-known British aeronautical scientists were expressing opposed opinions on the possibilities of the ramjet for aircraft propulsion.

A good deal has been published on the general subject—articles in *Flight* of August 15th, 1946, and February 3rd, 1949, and a chapter in the book *Gas Turbines and Jet Propulsion*, are cases in point—but comparatively little about the practical applications of the ramjet, for military purposes in particular, was made public until quite recently, when Malcolm Harned read a paper before the American Society of Mechanical Engineers.

Mr. Harned is chief designer to the Marquardt Aircraft Company, of Van Nuys, California. Marquardt engines, fitted experimentally to the wings of an F-80 Shooting Star, made possible in 1947 the first piloted flight under ramjet power only, and units designed and built by the same firm are now employed in a number of aircraft, including the Hiller Hornet and McDonnell XH-20 helicopters and the Martin KDM-1 target drone. Mr. Harned's address, therefore, reflected considerable practical experience, and the material that follows is based largely on his remarks.

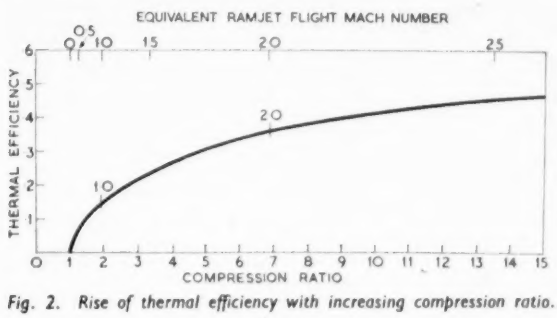


Fig. 2. Rise of thermal efficiency with increasing compression ratio.

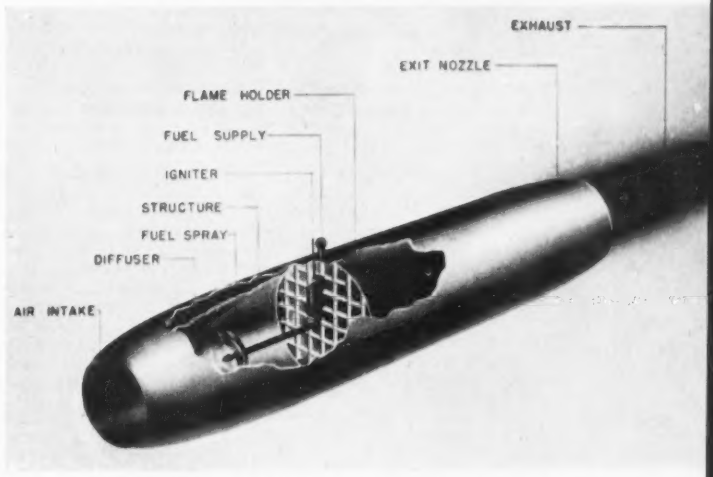


Fig. 1. The Marquardt XRJ-31-MA-1—a typical subsonic ramjet.

Fig. 1 shows a cutaway view of the Marquardt XRJ-31-MA-1 subsonic ramjet engine. In spite of its simple appearance, such a unit extracts power from fuel on the same basic principle (induction, compression, combustion, expansion) as that of any air-breathing engine. In this case, however, air is inhaled under ram effect by reason of the forward motion of the aircraft. It then enters a diffuser, which is, in effect, a tube of gradually increasing diameter, though of very critically designed section. Air flowing through such a tube loses velocity and consequently (in accordance with Bernoulli's principle) becomes compressed because its total energy must remain unchanged. Fuel is then injected into the airstream, which becomes heated as combustion takes place and expands through the exhaust nozzle in the form of a high-velocity jet. The thrust acts on the inside of the forward part of the diffuser.

Turbo-ramjet is a term used for a combination of diffuser, turbojet, and afterburner, in which the turbojet acts as a compressor to provide static thrust, thus allowing the unit to operate without forward motion of the aircraft. The afterburner might be termed a ramjet masquerading under another name.

Fig. 2 shows a typical relationship between thermal efficiency and compression ratio for any internal combustion engine, and the ramjet-flight Mach numbers plotted along the top axis make it clear that, for this type of power flight, thermal efficiencies comparable to those obtained with other types can be obtained only when speeds of the order of Mach 2 (compression ratio approximately 7 : 1) are employed.

In endeavouring to decide when it is practicable to choose a ramjet power plant, five factors must be taken into consideration —performance, reliability, cost, installation and serviceability.

Performance. Fig. 3 shows the speeds which have been obtained to date with various types of power-plants, with certain predictions

RAMJET POSSIBILITIES . . .

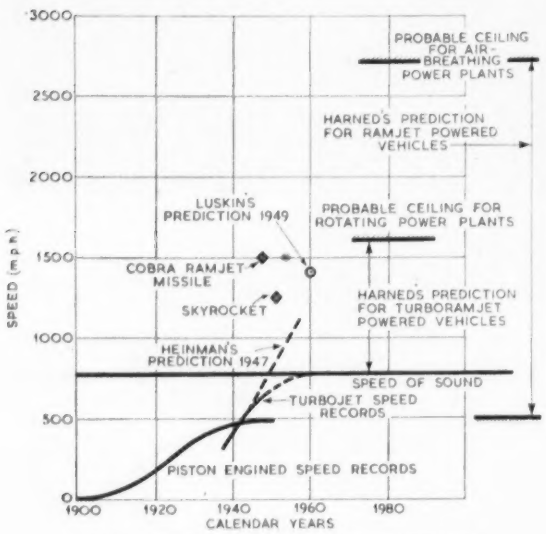


Fig. 3. Aircraft speed records, past and predicted.

added. The turbo-ramjet will probably permit velocities of up to 1,700 m.p.h., at which speed the total temperature of the air inlet approaches the maximum permissible temperature of the turbine blades. For ramjet vehicles themselves, maximum speed seems likely to become stabilized at about Mach 4, or 2,700 m.p.h., because of the limitations imposed as a result of reaching a free-stream total temperature of 1,400 deg F. To exceed such a temperature would cause the skin of the vehicle to become literally red-hot. Furthermore, as can be seen from Fig. 4, the thrust coefficient of the engine is, at such a speed, already showing a decline because of the diminishing temperature-rise available from hydrocarbon fuels, which produce temperatures not exceeding 3,500 deg F when burnt.

Such, then, are the predictions concerning the performance of this new type of motor. On what facts are they based? Fig. 5 shows an approximate plot of power/weight ratio against Mach number for the various types of power-plant. It affords an idea of the enormous increase in power per unit weight available for future aircraft—power which is so fundamentally necessary, in that above Mach 1 the total required is proportional to the cube of the speed, whilst at the same time the lift/drag ratio is four to ten times less than it is at subsonic speeds. From Fig. 5, therefore, the ramjet can be seen as an attractive proposition from the weight standpoint at all speeds above Mach 0.6.

The most vital aspect of all, however, is that of specific fuel-consumption, and Fig. 6 illustrates variation in this value with Mach number for the different types of engine. It will be observed that above Mach 2 the ramjet really comes into its own—and

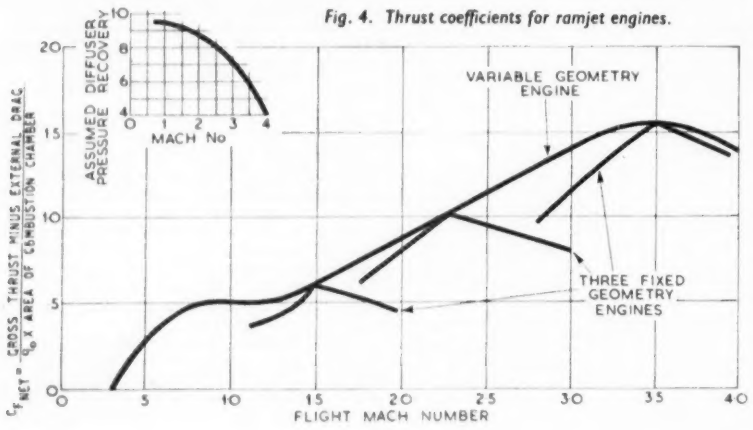


Fig. 4. Thrust coefficients for ramjet engines.

The Hiller HJ-2 Hornet helicopter, powered by two Hiller 8RJ-C ramjets.

that below Mach 1 the consumption is quite excessive. As a matter of interest, above 35,000ft, Mach 2 is about 1,320 m.p.h.; Mach 1 approximately 660; and Mach 0.6 is about 396.

Reliability. In this sphere the ramjet shows immense promise. Such prophecies are often dangerous, but if it is realized that a complete supersonic engine capable of producing over 100,000 h.p. can be built with only half a dozen moving parts, including the fuel pumping and controlling systems, there is clearly reason behind it. In addition, it can be remembered that none of these few moving parts is in contact with the hot gases, which is certainly not the case in any other air-breathing power-plant.

Cost. Broadly speaking, no matter what type of aircraft engine is being produced, the cost per pound weight is always very roughly the same. Another glance at Fig. 5 will at once make clear, therefore, the extremely low cost per horse-power of the ramjet. Additionally, above Mach 2, the operating cost in terms of fuel is lower than for any other type of engine.

Installation. Ramjets are easy to instal, and particularly suitable for "podding." The advantages of the latter system include the facts that the engine is then easy of access and readily changed, while the fuselage is largely isolated from vibration. Such an arrangement also facilitates engine development, or the substitution of one unit for another. The obvious disadvantage, in certain aircraft configurations, is an increase in overall drag.

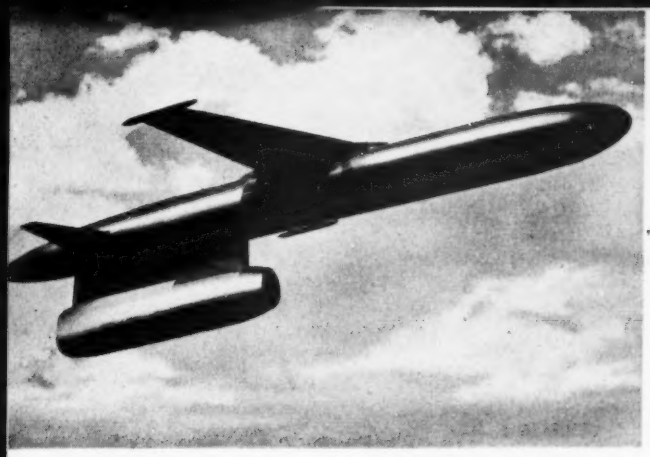
Serviceability. This presents no problem, owing to the simple nature of the engine.

So far, we have considered the general characteristics of ramjets. What of their application to specific classes of aircraft? In the subsonic category, because of excessive fuel consumption, applications are strictly limited; in fact, only three present themselves. Target drones are a field where low cost is paramount, and the U.S. Navy's KDM-1s, fitted with Marquardt XRJ-30-MA-8 engines, are a good example. The cost of this type of engine is quoted as 50 cents per horse-power as compared with a minimum of $5 for a reciprocating engine. Helicopters can be inexpensively powered with rotor-tip ramjets, and both Hiller and McDonnell have developed aircraft of this type. Control is good but range, inevitably, only fair.

Finally, in the subsonic field, convertiplanes provide the most promising application. By using small high-speed rotors with tip ramjets for vertical ascent and engine-driven airscrews for forward motion, a high speed convertiplane with good range could very simply be achieved. The value of such craft for both military and civil applications is obvious. In such applications the ramjets would be used only for a few minutes during take-off or landing and therefore the fuel consumption is a negligible consideration. The use of ramjets for powering rotors has already been proved practicable by McDonnell and Hiller, but the convertiplane application must wait for development of a variable-geometry ramjet, which will significantly reduce the cold drag of the non-burning ramjet to permit efficient auto-rotation when in cruising flight. This problem is being worked on and should be solved by the time airframe designs are developed. In this connection, Mr. Harned predicted that within a very few years the feederline transport would give way to the ramjet convertiplane, with the consequent elimination of airports for this type of service.

Turning now to supersonic aircraft, security unfortunately prevents discussion of projects actually under way, but certain general conclusions can be drawn.

Supersonic transports. These will not



(Above) The Martin KDM-1 target drone. (Right) The McDonnell 11 XH-20 ramjet helicopter, nicknamed "Little Henry."

arrive for many years simply because any form of supersonic transport would be prohibitively expensive to operate.

Supersonic bombers. Range limitations preclude such craft designed to cruise permanently above Mach 1 unless enormous size is contemplated, but a considerable case can be made for the turbo-ramjet-powered bomber fitted with ramjets for supersonic spurts.

Supersonic intercepters. In general, it appears that piloted supersonic intercepters will gradually evolve from the present-day subsonic turbojet intercepters with each step leading farther through the transonic régime to h¹gh supersonic speeds. In this evolution the large increases in power required will initially be obtained by converting the turbojets into turbo-ramjets by the addition of afterburners and efficient diffusers for ram compression. But when the flight Mach number reaches 2.0, the efficiency of the more simple ramjet will overtake that of the turbo-ramjet, and the former will then become of interest as the primary powerplant.

To illustrate this fact, a simplified comparison at the crossover Mach number of 2.0 for an intercepter powered with turbo-ramjets and with a combination of ramjets and rocket booster is given in Table 1. The provision of rocket boost to accelerate the aircraft from zero velocity up to one at which the ramjet can take over is, of course, essential.

Table 1

Factor	Turbo-Ramjet	Ramjet + Rocket
Cruise Mach No.	2.0	2.0
Gross weight	25,000 lb	25,000 lb
Launching method	Horizontal take-off	Vertical
Percentage structural weight	30	25
Tank weight	10 per cent fuel weight	10 per cent fuel weight
Payload, pilot, equipment ...	2,000 lb.	2,000 lb
Max. net thrust	30,000 lb at Mach 1.0	Ramjet, 28,000 lb at Mach 2.0; rocket, 35,000 lb
Powerplant weight	10,000 lb	Ramjet, 1,700 lb; rocket, 900 lb
Time to 60,000ft	2½ min	2 min.
Range	190 miles	210 miles

At speeds in excess of Mach 2, the rocket-ramjet combination will gain increasing advantage. The combination has the disadvantage of carrying an oxidizer as well as fuel, but has simple fixed-geometry engines, whereas the turbo-ramjet requires variable-geometry arrangements for both inlet and exit nozzles. Since fuel costs only a small fraction of airframe weight, it can be seen that the rocket-ramjet fighter will be less expensive for a small number of sorties per aircraft, whereas the turbojet fighter would be more economical for a large number.

An obvious way in which the turbo-ramjet could be modified to extend its efficient operating range up to Mach 4 would be to by-pass the gas turbine above Mach 2.0, thus converting it into a ramjet. Although the air-ducting problems would present serious obstacles, this offers interesting theoretical possibilities.

Supersonic pilotless aircraft. The field of supersonic pilotless aircraft offers the greatest potential for the application of the ramjet engine. The principal reasons are : (1) In order to be effective they will need to operate at high Mach numbers—at least above 2.0—where the ramjet is the most efficient power-plant available. (2) Low engine-cost is essential for these expendable missiles (3) Since these are "one-shot" vehicles and liquid fuels will cost less than one thousandth of the airframe cost per pound, fuel costs will be negligible and the cost of rocket fuel for boost will be of little concern.

Three classes of pilotless aircraft require consideration :—

Air-to-air missiles. The supersonic intercepter will undoubtedly

Fig. 5. Comparison of power/weight ratios for various types of engines.

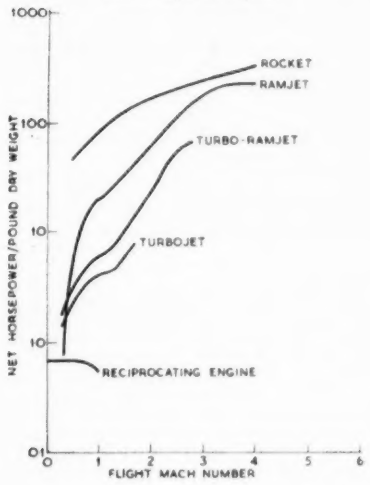


Fig. 6. Comparison of specific fuel consumptions for various types of engine.

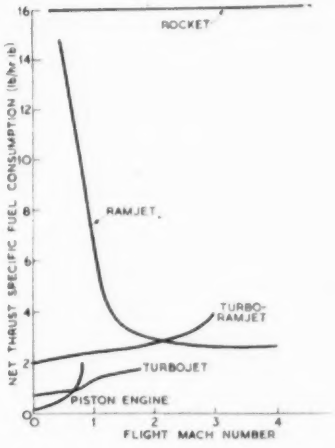
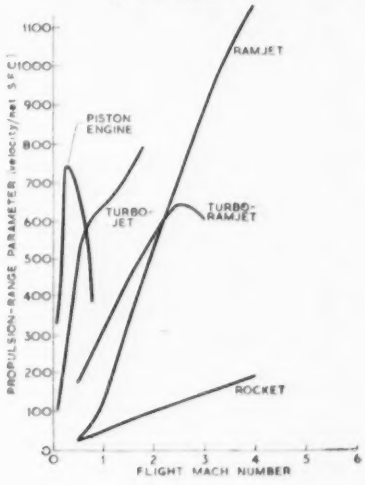
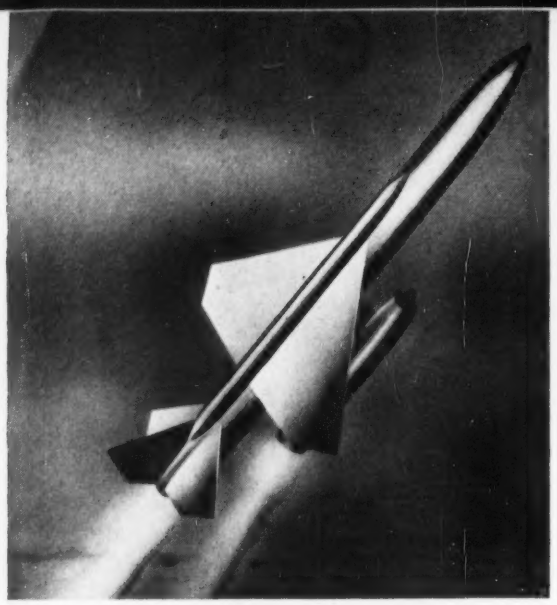
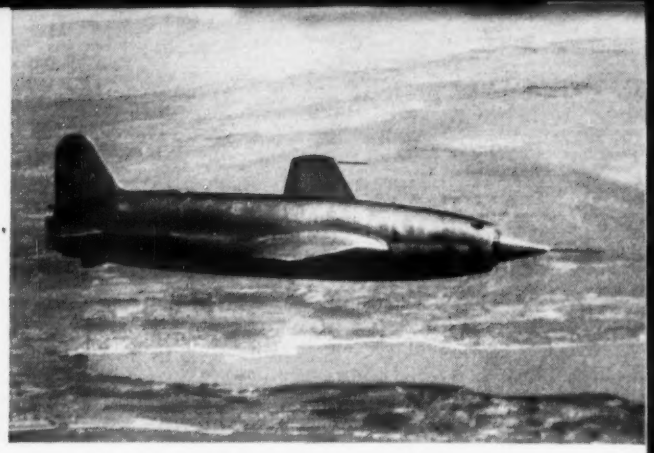


Fig. 7. Propulsion-range parameters for various types of engines.







(Above) The Leduc O.10 experimental aircraft, powered by a Leduc ramjet. Accommodation is for two in tandem in the jettisonable nose section.

(Left) Glimpse into the future: the Boeing Bomarc ground-to-air guided missile. Also known as the F-99, the weapon has both rocket and ramjet power and is reported to be capable of more than 1,500 m.p.h. The warhead is located in the nose, and full electronics are carried for locating and tracking enemy aircraft.

RAMJET POSSIBILITIES . . .

carry relatively short-range seeker-missiles for armament. Usually, the rocket motor is the most attractive for such short-range applications. When the intercepter is flying at supersonic speeds, however, a ramjet-powered missile would require no boost for launching, and would, thus be a very attractive proposition.

Pilotless bombardment aircraft. In the selection of a power-plant for long-range pilotless aircraft the propulsion range parameter—speed divided by net thrust specific fuel consumption—is the most important consideration, since range is directly proportional to it. Fig. 7 presents this parameter as a function of Mach number. It is apparent that for Mach numbers from 2 to 4 the ramjet is the most attractive. From the weight and cost standpoint the ramjet is also the optimum power-plant in this Mach number range.

Pilotless intercepter aircraft. As soon as adequate guidance systems are developed the necessity for a pilot will undoubtedly be eliminated from most intercepters. The following criteria will very likely determine the design of the pilotless intercepter: (1) Maximum possible speed consistent with the available materials, in order that the aircraft may be able to shoot down bombers capable of transonic and supersonic flight speeds. (2) Range as close to current intercepter minimum range of 500 miles as possible. (3) Vertical launching in order to eliminate any requirement for runways, making it possible to locate aircraft at any place ready for take-off. (4) Take-off thrust much greater than vehicle weight in order to be able to make satisfactory vertical take-off and to provide maximum accelerations in order to get to altitude as rapidly as possible. (5) Lowest possible cost.

These general requirements, in Mr. Harned's view, point directly to the rocket-ramjet combination for powering the pilotless intercepter. The study in Table 1 showed the performance of the rocket-ramjet piloted intercepter to be approximately equal to that of the turbo-ramjet version at Mach 2.0, and it will become superior at high Mach numbers. In addition, it should be possible to drop the rocket booster, giving a greater range advantage for the rocket-ramjet combination. It would appear, therefore, that from a performance standpoint the rocket-ramjet combination is the best choice. For high thrust and vertical launching the rocket boost is almost essential; for minimum cost the rocket-ramjet combination is unquestionably the optimum, since total powerplane weight is a fraction of the turbo-ramjet weight and the fuel cost is of negligible concern for the one-shot operation.

Prospects for the Lansen

A RECENT Press showing of the Saab-32 (A32) Lansen all-weather attack aircraft (Rolls-Royce Avon) was the occasion for the disclosure that the Royal Swedish Air Force has decided to equip most of its attack units (there are at present twelve squadrons) with this type. From a central Swedish air base, said a Swedish Air Force spokesman, the Lansen is capable of carrying its armament of cannon, rockets and "other modern weapons" to any part of the country's 1,250-mile long coast in less than one hour, at night or in any kind of weather. It was also made known that production aircraft will be powered by advanced reheat versions of the Avon, built under licence in Sweden.

The photograph on page 13 shows that the original leading-edge automatic slots have been replaced by boundary-layer fences. It can now be confirmed, furthermore, that the Lansen has powered ailerons and elevators, cockpit refrigeration, anti-skid wheel brakes, easily removable rear fuselage, and provision for dual control.

Labour Policy and the Industry

A REFERENCE to the aircraft industry is made by the Labour Party in their new policy statement entitled "Challenge to Britain." Full-scale nationalization is not proposed, but there is a promise—or threat—that the next Labour Government will take powers to acquire firms which fail to toe the party line.

The statement begins by declaring that the aircraft industry has an exceptional position, in that its relations with the State are already close, and that the nation buys most of its products—through the Royal Air Force, the Fleet Air Arm and the publicly-owned airways. It continues: "Most of the finance required for the industry's fundamental research, whether in Government establishments or in aircraft factories, is provided by the Government. The industry depends on continuous and high-powered research. The Labour Government's post-war decision to concentrate on long-term projects brought rich dividends. The improvement of the gas turbine gave the British industry a world lead, not only invaluable for defence, but opening up wide export prospects.

"These export potentials have two aspects. The sale of aircraft to foreign buyers is well illustrated by the order for a number of Comet aircraft by an American airways service and by foreign purchases of our military aircraft. In this field skilled labour and scientific knowledge make up a very large part—raw materials a very small part—of the manufacturing costs. When we export a Comet we get something like £30,000 per ton of raw materials used in its manufacture, as against, £600 a ton for a motor car.

"Another type of aircraft export is the sale of passages on British airliners. By giving British airways the best planes first, we can increase our foreign earnings from air travel enormously. But whether we can do all this depends upon the rapidity with which we can expand the industry and adapt output to the market's needs.

"Long delivery dates are at present its weakest point. The Government is already helping in the production lines by leasing special equipment such as machine tools. Such help Labour will extend to cover other processes, and it will be up to the aircraft companies to see that the nation's hopes are realized.

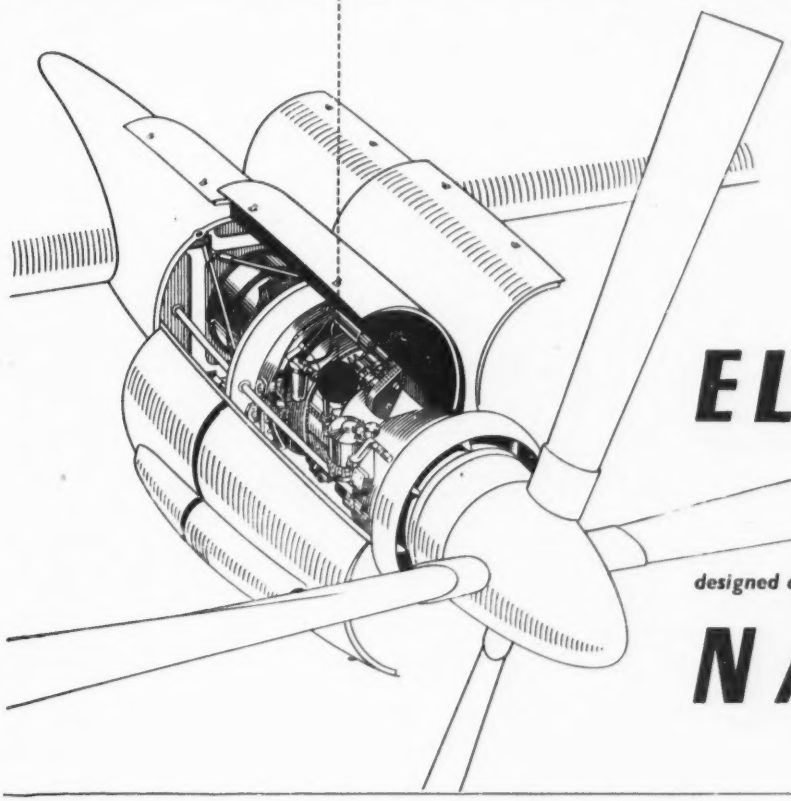
"But in this vital industry lack of enterprise and over-caution cannot be tolerated. The next Labour Government will, therefore, take powers to acquire any firm which falls down on its job, especially if it neglects valuable opportunities for expansion."

Large-screen Television

ON Monday, June 15th, GB-Kalee, Ltd., gave a demonstration of their new teleprojector to an invited audience at their private theatre in Wardour Street, London, to see the B.B.C. television broadcast of the Royal Naval Review at Spithead. The teleprojector has a screen 4ft by 3ft and the picture is seen through a translucent screen by means of rear-projection from inside the cabinet. It is possible for audiences of up to 350 to watch the screen, sitting in (for example) hotel lounges, canteens and small cinemas; for any picture adjustments that may have to be made during the programme there is a remote-control unit.

Access to economy

The economics of maintenance are highly susceptible to variations in accessibility. In the design of the Eland maintenance facilities have been carefully studied, and the extreme compactness of this high-rated unit has been achieved in a manner which aids access to all points subject to periodical attention.



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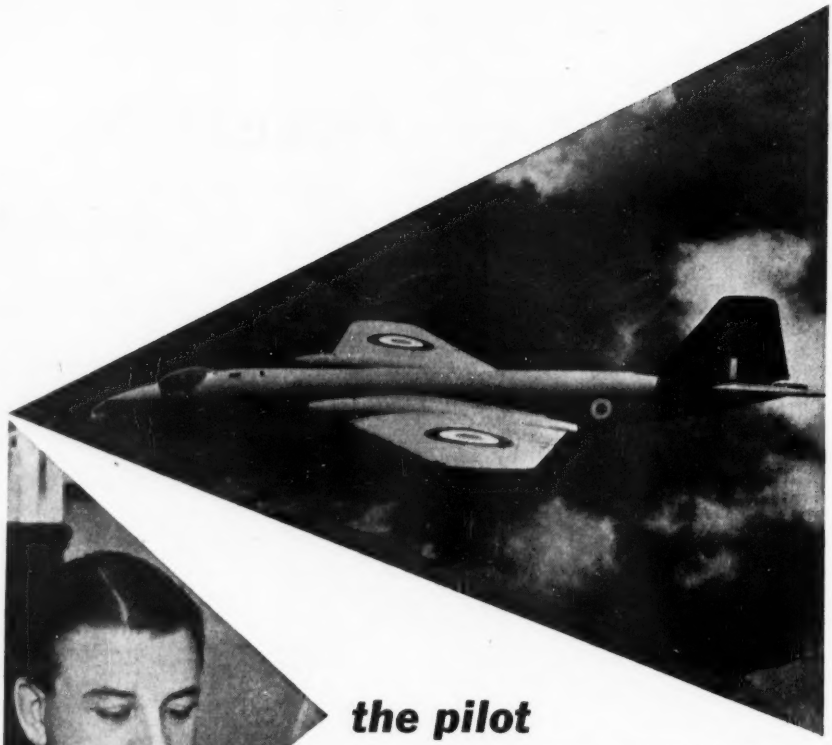
The aeroplane

The 'English Electric' Canberra. First jet bomber in Squadron Service with the Royal Air Force, this famous aircraft is now in quantity production for the R.A.F., R.A.A.F., and U.S.A.F. World records include the first two-way crossing of the Atlantic in one day. The English Electric Canberra recently set up another record, made possible by the two 'Bristol' Olympus turbo-jets with which it was powered. Ceiling now 63,668 ft., or over 12 miles.



the pilot

32-year old R. P. Beamont has been Chief Test Pilot of the English Electric Company since 1947. He served with the R.A.F. during the Battle of Britain and the Normandy Invasion. War record includes 10 enemy aircraft shot down ; 32 flying bombs destroyed ; D.S.O. and bar ; D.F.C. and bar. Beamont is a member of the English Electric team which evolved the Canberra. He flew it on its maiden flight and in most of the subsequent development and demonstration flying here and abroad. Of Shell and BP Service he says : " It is most efficient and is invariably of great assistance on long distance flights."

Shell and BP Aviation Service

Nowadays, when a test hop might mean Cairo and back in under eleven hours, it is good to know that the Shell and BP Aviation Service will be waiting with all the service comforts at home. Aircraft manufacturers and their test pilots appreciate this. So do many others in the fields of commercial and private flying. Whatever your refuelling needs, whenever you're in need, you can rely on Shell and BP Aviation Service to be johnny-on-the-spot to serve you.

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AIRLINE APPRENTICESHIPS

COMPARATIVELY little has been heard of the way in which young men wishing to enter the engineering section of B.E.A. and B.O.A.C. can best receive their training. The two Corporations in fact run a comprehensive apprenticeship scheme, brief details of which are here given.

Recognizing that they are unable by themselves to offer basic and complete engineering training, the Corporations have arranged for the facilities of certain firms, colleges and Government establishments to be made available to the airlines' apprentices, who are divided into two groups.

Firstly, the craft apprenticeship is intended to train boys to become skilled practical aircraft maintenance engineers, and to fit them for inspection or supervisory posts at a later date. It caters for pupils from secondary, grammar, technical and modern schools who show ability in mathematics, science and English (and preferably technical drawing). A pronounced technical aptitude and a general interest in aeronautical engineering are both essential.

Craft apprentices are trained in the trades of airframe/engine fitter, aircraft electrician, instrument repairer, and radio mechanic. No entrance examination is required, but all candidates are interviewed and may be required to undergo certain aptitude tests. Successful candidates receive their basic training for up to three years at Ministry of Supply training establishments, or with various manufacturers, but remain under the guidance of the Corporations. Then they return to the Corporations for final training in the hangars and workshops. Normal age at entry is from 16 to 17 years.

The second type is the engineering apprenticeship; a highly technical training, which can lead to executive or technical positions with the Corporations. Candidates must have passed the Civil Service Commission's open competitive examination for engineering apprentices, and of necessity must possess a technical, grammar or public school education with emphasis on mathematics, physics, chemistry and English. Age at entry is normally between 16 and 18 years.

After selection, engineering apprentices spend the whole of their five years' training at the Royal Aircraft Establishment, Farnborough, where both practical and theoretical instruction is given.

Both types of apprentice are indentured for five years, and no premium is required. Further details of the scheme can be obtained from either the Education and Training Officer, B.O.A.C., Airways House, Great West Road, Brentford, Middlesex, or the Staff Services and Training Officer, B.E.A., Keyline House, Ruislip, Middlesex.

Fairey Missile Appointment

BY arrangement with the Ministry of Supply, the Fairey Aviation Co., Ltd., have appointed Brigadier J. Clemow to be head of guided weapon development at their Research and Armament Development Division.

Brigadier Clemow, who is 41, was educated at Borden Grammar School and at St. John's College, Cambridge, of which he was a Senior Scholar. He was classed Wrangler with distinction in the Mathematical Tripos of 1933. When war came in 1939 he was a Territorial with the Surrey and Sussex Yeomanry R.A., and he served with various regiments of the Field Artillery until 1942, when he went to the Military College of Science, first as a student and, later, as an instructor on radar, predictors and artillery equipment. From 1944 until 1947 he was employed on armament design and development and took part in post-war investigations of German guided missile activities. He was sent to the U.S.A. for a year to study guided weapons with the U.S. Army; then for three years to the Royal Aircraft Establisment as project leader of a team working on a British missile. His last appointment, dating from 1951, was at Ministry of Supply Headquarters as an assistant director guided weapon research and development.

FORTHCOMING EVENTS

July	4-6.	R.Ae.C.: Members' Deauville Rally.
July	9.	Jersey Air Display.
July	11.	"At Home," R.N. Air Station Anthorn.
July	11.	Auster Flying Club: Display.
July	11.	Cardiff Aeroplane Club: Display, Pengam Moors Airfield.
July	12.	Northern Heights Model Flying Club: Gala Day.
July	12.	International Parachute and Gliding Meeting, Brussels.
July	15.	Royal Air Force Coronation Review.
July	18.	Vintage Aeroplane Club: Rally, White Waltham.
July	18.	"At Home," R.N. Air Station Brawdy.
July	18.	Royal Netherlands Air Force and Royal Netherlands Aero Club: N.A.T.O. Display, Soesterberg.
July	18-19.	Aero-Club d'Italia: Dolomites Tour.
July	19.	Aero-Club de la Vendee: Sables d'Olonne Rally.
July	22.	"At Homes," R.N. Air Stations St. Merryn and Arbroath.
July	25.	"At Homes," R.N. Air Stations Ford and Stretton.
July	25.	R.Ae.C.: National Air Touring Competition
July 25-Aug.	3.	B.G.A. National Gliding Championships Great Hucklow.
July	26.	R.A.F. Model Aircraft Association: United Kingdom Championships, St. Athan.
July	26.	International Radio-Controlled Models Society: Aircraft Contests, Southend-on-Sea Airport.
July 27-Aug.	1.	Aero-Club de France: Parachuting Championships Blois-Le-Breuil.
Aug.	1.	Opening of Jan Smuts Airport, Johannesburg.
Aug.	1-3.	S.M.A.E.: World Model Championships, Cranfield.
Aug.	8-13.	Round-Switzerland Air Tour.
Aug.	22.	Coventry Air Day and Siddeley Challenge Trophy Race.
Aug.	23.	St. Albans Model Aero Club: All-Britain Model Aircraft Rally, Radlett.
Aug.	30.	Aero-Club d'Italia: Pescara Rally.
Sept.	3-10.	Aéro-Club de Cannes: Cannes Grand Prix.
Sept.	6.	S.M.A.E.: "Yorkshire Evening News" Model Flying Festival, Sherburn-in-Elmet.
Sept.	7-13.	S.B.A.C.: Farnborough Display and Exhibition.
Sept.	12.	"At Home," R.N. Air Station Eglinton.
Sept.	14.	R.Ae.S. Wilbur Wright Memorial Lecture: "Structures," by Prof. N. J. Hoff, F.R.Ae.S., F.I.Ae.S.
Sept.	14-17.	R.Ae.S. and I.Ae.S.: Anglo-American Aeronautical Conference.
Sept.	15.	Battle of Britain Day.
Sept.	19.	"At Home," R.N. Air Station Abbotsinch.
Sept.	19.	R.A.F. At-Home Day.
Oct.	8.	Start of England-Christchurch (N.Z.) Air Race.
Dec.	17.	Anniversary of the Wright Brothers' First Flight.

Sweden's "Operation 700"

AS briefly recorded in *Flight* recently, June 6th, Sweden's national day (and Stockholm's 700th anniversary), was celebrated by what is claimed to be the largest air display staged in Europe since the war. Lt.-Gen. Bengt G. Nordenskiöld, C-in-C. of the Swedish Air Force, led the display, which was known as Operation 700, units from practically all peace-time squadrons and training centres participating. Among the types of aircraft which took part were Saab J-29s, A-21s and A-21Rs, and twin-engined B-18s, in addition to Vampires, Spitfires and Mustangs. Making its first public appearance, the Draken delta gave a five-minute aerobatic display. Proceedings had been opened by 79 trainers which formed "ST ERIK," the monogram of Stockholm's patron saint, and the final "set-piece" was the national three-crown symbol.

In The Commons

A PROPOSAL to operate amphibious helicopters between London Airport and that stretch of the Thames lying between London Bridge and Vauxhall Bridge was recently the subejct of a joint examination by B.E.A. and the M.C.A. This was revealed by Mr. J. D. Profumo, Parliamentary Secretary to the Minister, who said in reply to a question by Cdr. R. A. Langford-Holt that the limited value to be obtained from such operations with existing types of fully-developed helicopters would not justify the cost to public funds.

The results of discussions between the Minister of Civil Aviation and the L.C.C. on the siting of a helicopter landing-ground in central London were referred to by Mr. Lennox-Boyd in the Commons on June 10th. He said the talks had covered the earmarking of a site on the South Bank for occasional landings by existing helicopters, and suggestions for a larger airstop capable of accommodating the Bristol 173 when it could come into regular service. Meanwhile, and until more was known of the characteristics of the intermediate type, he did not propose to begin work on an airstop in central London. He was, nevertheless, sure that requirements would be finalized, and an airstop developed, before the type came into commercial service. The long-term requirements for a permanent site to accommodate the largest helicopters would depend on experience gained in handling the intermediate types.

Col. Marcus Lipton complained of departmental delay in the matter, and suggested that the South Bank and the roof of Waterloo Station were clearly the most suitable sites for the purpose. The Minister agreed that these might well prove to be the most suitable, but he thought it obviously unwise to act in advance of the knowledge on which a decision would have to be based.

Asked by Mr. Frank Beswick whether a "fast and firm" decision had in fact been made to develop Gatwick as the main alternative to London Airport, Mr. Lennox-Boyd said that the Government suffered under some difficulties not altogether of its own making; one of the problems in this matter was an assurance given by the late Socialist administration that they did not propose to develop Gatwick as a major airport. It was out of that undertaking, and the inferences drawn therefrom, that difficulties had since arisen. Until these points, together with certain technical problems connected with the layout of the aerodrome, had been resolved, the Minister had nothing to add to the statements previously made.

CORNISH NAVAL AIR DAY

R.N.A.S. Culdrose Stages a Successful Coronation Display

SHORT of going to sea in an aircraft carrier, there is no better way of learning about the Fleet Air Arm than to attend one of the air days held annually by Naval air stations. Such an event was staged on June 20th by H.M.S. *Seahawk*, alias R.N.A.S. Culdrose, which is situated in typically beautiful Cornish countryside near Helston. In an area which is sparsely populated, the attendance figure of 9,000 is indicative of the interest displayed by the neighbouring public.

"Flight" photograph

ROTARY RESCUE: Culdrose maintains an S-51 Dragonfly at constant readiness for rescue work, as demonstrated here during the recent station's air day.

Housing a great diversity of aircraft, *Seahawk* is one of the most interesting Naval air stations, as well as one of the most attractive, with its rural setting, neat buildings and trimly cropped grass enclosing long runways. In the words of its commanding officer, Capt. H. C. N. Rolfe, it is also "the most modern and probably the busiest." Culdrose is responsible for the advanced training of all Naval fighter pilots, and the circuit is used daily by all the latest Naval types of jet and piston-engined high-performance aircraft. In addition, it is the base for an early-warning squadron and, when necessary, for one or other of the carrier air groups.

Over the past year the Fleet Air Arm has undergone a good deal of reorganization and re-equipment, and this is reflected by the present set-up at Culdrose. No. 736 Squadron, the advanced jet unit, is fully equipped with Attackers and Meteor 7s, and is feeding pilots to the new front-line Attacker, Sea Venom and Sea Hawk squadrons. First principles of jet-fighter handling technique are taught, in Meteor 7s, Vampire T.11s and Sea Vampires, by No. 759 Squadron. Sea Furies—both single-seaters and tandem training versions—equip No. 738 Squadron, whose strength was increased from 14 to 28 aircraft when 736 Squadron re-formed with jets last August.

All three squadrons of the Naval Air Fighter School were represented in the composite Sea Fury-Attacker-Meteor mass formation which flew over Culdrose during the display. Many of the participating pilots had arrived there only within the past two or three weeks on completion of their 15 months' basic and elementary flying courses, but the formation was near-perfect.

Also at *Seahawk* is the only American-equipped squadron of the Fleet Air Arm—No. 849, which has three-seat Douglas AEW Skyraiders. These mighty single-engined machines carry a powerful under-belly search radar, whose two operators scan the movements of ships and low-flying aircraft.

Skill, precision and dash are all demanded of the Naval pilot—and these qualities were displayed from start to finish of the Culdrose flying programme. The curtain-raiser, billed as "Vampires in Combat," was performed by Lt.-Cdr. Price and Lt. Whitehead, who dog-fought with great realism. Their mock battle was followed by an exhibition of dive-bombing, combined with trim aerobatics, by three Sea Furies (pilots, Lt.-Cdr. Abraham and Lts. Young and Austin). A small water tank in front of the control tower, containing an occupied one-man dinghy, then attracted the attention of the crowd and of an S-51 Dragonfly. The rotorplane windmilled to an aerial standstill overhead, dropped its rescue harness and, in now customary fashion, winched up the "stranded pilot." An informative programme pointed out that the S-51 is in fact maintained for this very purpose, supplementing the A.S.R. launches at Falmouth.

An item we had not seen previously was the relay race between two three-man teams ("old pilots and young pilots") flying, in each case, one Attacker, one Sea Fury and one Meteor 7, but in different orders of take-off. An Attacker and Sea Fury set off first; the second and third aircraft in each team were flagged away as their respective predecessors re-appeared overhead. There was, of course, no need for handicapping, as the average speed of each team was potentially equal. Aircraft remained in view throughout the 11-minute, three-lap race. The result was a win by at least 20 sec for the young men, who saved their Meteor 7 for the final lap.

The printed programme explained the background to the next event—an Army-support demonstration in which soldiers called up two Sea Vampires from a "cab-rank" to soften-up a strong point. Culdrose houses the H.Q. section of the Carrier-borne Ground Liaison (C.B.G.L.) Group, which attaches small Army sections to both ships and air stations and provides the link between the land forces and the F.A.A. One of their many tasks is to brief and train Naval pilots, including those now serving off Korea, in ground-support duties.

The C.O. of No. 736 Squadron, Lt.-Cdr. Rawbone, led an aerobatic team of four Meteor 7s which remained inseparable even at the point of touch-down. Despite a stiff cross-wind gusting up to 30 kt, they made a flawless landing in box formation. In contrast, Lt.-Cdr. Abraham's Sea Fury formation performed synchronized aerobatics after taking off from opposite ends of the runway. A "cross-over" was the finale of this event, the Sea Furies approaching from four points of the compass to pass each other in the centre of the airfield. Between aerobatic shows there was a fire-fighting competition in which the Penzance Brigade fought gallantly but were outstripped by the *Seahawk* team.

Judging from the buzz of excitement produced by its arrival, the Canberra B.2 brought from Manby by Cdr. Stovin-Bradford (who is undergoing a course at the R.A.F. Flying College) and F/L. Ringer was the first seen at close quarters in this part of Cornwall. The R.A.F. pilot's demonstration routine was simple but extremely effective: a steep climb on take-off, very slow up-wind run past the enclosures with "everything down" and another steep exit from view, followed in quick succession by a speedy fly-past at nought feet. Another fine display was given by a Brawdy-based Sea Hawk of No. 706 Squadron, whose Ace of Diamonds emblem was plainly visible on the fuselage. We heard praise from all sides for Comm. Plt. Walker's handling of this trim, lively fighter—the latest in service with the F.A.A.

The success of the Culdrose display could be attributed not only to the quality of the flying and precise timing of events, but also to imaginative presentation. The Skyraider's appearance, for example, was transformed from just another demonstration flight into an event of outstanding interest—by the simple expedient of linking a G.C.A. controller's microphone to the public-address system. Better than any printed explanation, the Skyraider's approach showed exactly how the talk-down is accomplished.

The final item was the fly-past and stream landing by 16 Sea Furies, eight Attackers and eight Meteors. Many of the Navy's guests remained after the display for Autocrat or Gemini joy-rides, or to inspect the static exhibition of aircraft and equipment.

MOCK ASSAULT AT SCULTHORPE

EARLY on the morning of Sunday, June 21st, a British parachute battalion made a mock attack on the U.S.A.F. base at Sculthorpe, Norfolk. The units concerned were a composite company of the 13th (Lancashire) Battalion, the Parachute Regiment (T.A.), supported by detachments from 300 Airborne Squadron, Royal Engineers (T.A.), 46 Parachute Field Ambulance (T.A.), 46 Airborne Workships (T.A.) and 5 and 6 sections 16 Airborne Divisional Provost Company (T.A.). On the previous evening four Fairchild Packets had flown at 700ft over a field to the west of the base and put down 152 parachutists. A diversionary raid was made by about a score of men around midnight, and two hours later the main force penetrated the airfield perimeter.

FAIREY GANNET

ANTI-SUBMARINE SUPER PRIORITY

. . . "Anti-submarine weapons, both shipborne and airborne, far more effective than anything known during the last war, are becoming available, and arrangements have been made to enable heavier and faster types of naval aircraft to be handled in, and operated from, our fleet carriers."

Extract from the Statement by the First Lord of the Admiralty explanatory of the **NAVY ESTIMATES, 1953/54.**

FAIREY AVIATION

THE FAIREY AVIATION COMPANY LIMITED · HAYES · MIDDLESEX

ejection seats . . .

During March 1953 over Chalgrove Aerodrome from a height of approximately 30,000 feet the Martin-Baker Patent Automatic Ejection Seat was successfully live tested.

Designed to reduce escape procedure to the minimum — once ejection is made the complete sequence of releases from the seat is automatic and no further action by the occupant is necessary.

Now in production, all high-speed fighters and bombers of the R.A.F. and R.N. will be equipped.

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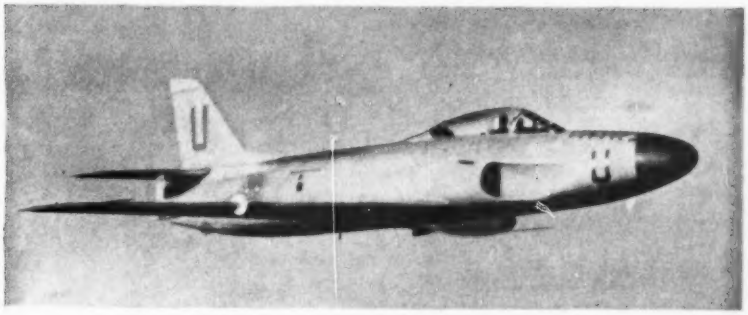
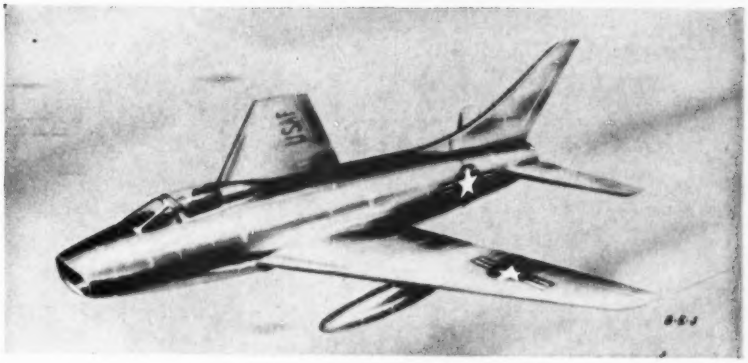
AIRCRAFT INTELLIGENCE





LANCE AND SABRE: (Top) One of the latest views of the Saab-32 (A32) Lansen prototype, showing the small leading-edge fences recently installed. A news item concerning this promising machine appears on page 10. The "Flight" impression, based on photographs of a model, shows the prototype of the North American F-100, the latest development of the Sabre. Larger than the present F-86, the F-100 has a Pratt and Whitney J57 two-spool turbojet, with afterburner, delivering a thrust of the order of 15,000 lb. The wing is more sharply tapered and is swept back at 45 deg; rockets are the sole armament and the tailplane has been lowered.

Britain

Vickers V.C.7. Encouraged by the smoothness of manufacturer-operator relations during the development and introduction of the Viscount, Mr. Peter Masefield is reported to be showing deep interest in the projected civil version of the Vickers 1000 four-jet transport (already backed by a military order). The V.C.7 is designed to carry 100-150 passengers economically on both long and short routes. If its performance comes up to expectations, the V.C.7 might well be selected as the fixed-wing replacement for all B.E.A.'s main-line aircraft. Large helicopters should by then be available to carry practically all traffic on the shortest inter-city routes.

Vickers Armstrongs Viscount. A report that the Hunting Air Transport, Ltd., order for Viscounts involved three aircraft has now been confirmed.

De Havilland Comet 3. A well-informed Dutch observer predicts that a K.L.M. order for Comet 3s will "eventually" be placed. Such an order would undoubtedly influence many airlines whose re-equipment plans are as yet uncertain.

U.S.A.

Republic F-105. Further to our note on this aircraft on this page in the May 15th issue, it can now be said that the F-105 is the big fighter/bomber, the F-103 being a Mach 2 fighter. The F-105, which has a very thin delta wing, is the subject of a large U.S.A.F. production order. Republic are now at work on the prototype, and are also developing the RF-105 high-altitude photo-reconnaissance variant.

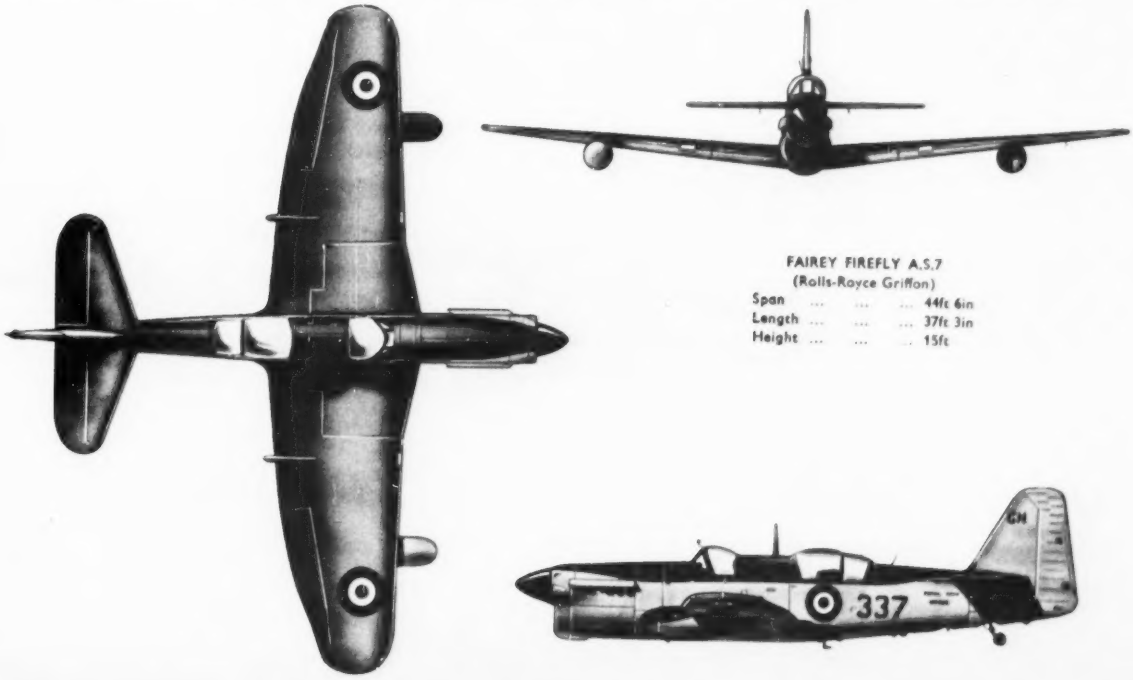
Fletcher FD-25B. This newest development of the Fletcher FD-25 light ground-attack aircraft, or "baby bomber," is expected to attain 187 m.p.h. on 250 h.p. Landing speed will be as low as 41 m.p.h. and take-off, fully loaded, should be effected in 500ft. Armament is two 0.30in machine guns, each with 1,000 rounds, and 650 lb of additional stores, bringing the gross weight to 2,500 lb. Representative under-wing loads are four 5in R.P.s, napalm tanks, or two 250 lb G.P. bombs.

Canada

Avro Canada CF-104. An unconfirmed report has it that Avro Canada are making a design study for a 35-ton delta-wing fighter, designated CF-104, powered with twin jets, and having air-to-air missiles as its armament.

Italy

AZ-1 Project. A new twin-engined transport is projected by Filippo Zappata. Designated AZ-1, it is intended to have Bristol Proteus 705 turboprops or Wright Turbo-Cyclones. The Proteus version should weigh 59,500 lb and the maximum speed is estimated to be 404 m.p.h.

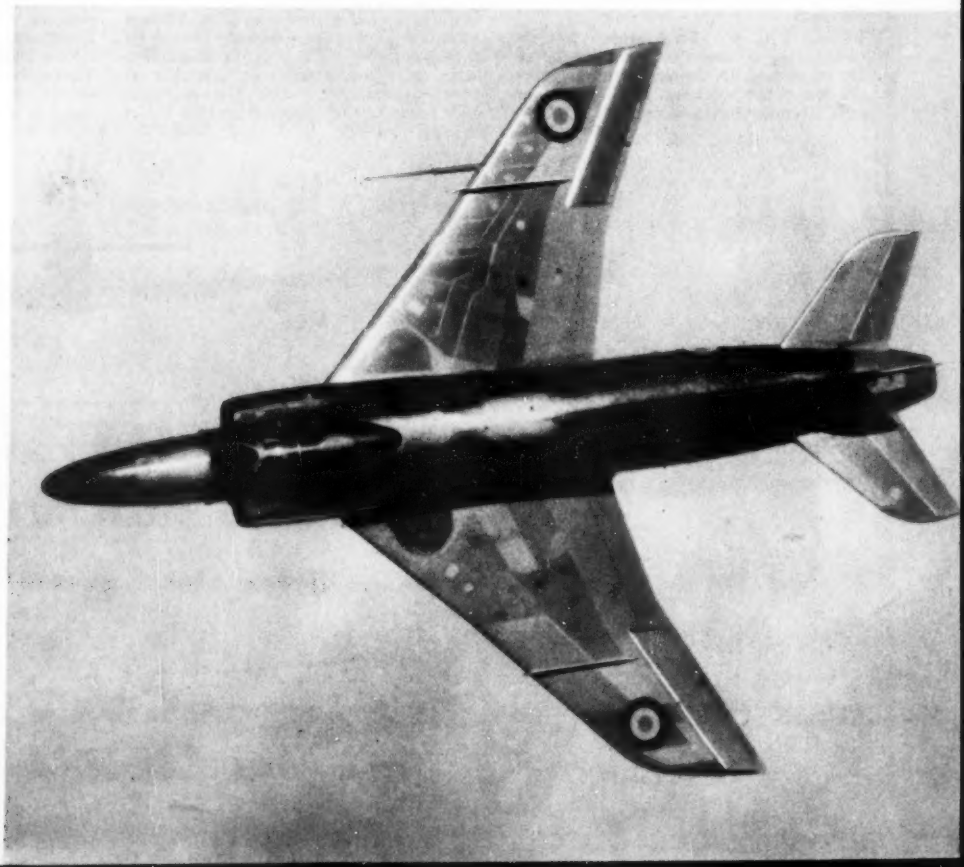


FAIREY FIREFLY A.S.7
(Rolls-Royce Griffon)

Span	44ft 6in
Length	37ft 3in
Height	15ft

BRITISH AND BEST

Our French hosts are unlikely to dispute our assessment of the Hawker Hunter (above) and Supermarine Swift (below) when they see them at Le Bourget.



"FLIGHT" PHOTOGRAPHS

THE TWENTIETH SALON

Opening Phases of the Paris Show at Le Bourget and Prospects for the Grand Finale

AT 10 o'clock on the morning of June 26th, with fitting honours, the Paris Aero Show (or Twentieth International Aeronautical Salon, to accord it due dignity) was inaugurated by Colonel Cressaty, of the President's staff. For the first time since 1909 the focus was transferred from the well-remembered Grand Palais by the Seine to a new, impressive and permanent building on the historic airfield of Le Bourget. With its covered area of over 98,000 sq ft and frontage of 360ft this accommodates without constriction the stands of some 150 exhibitors. Liberal fenestration and coloured draperies impart a light and cheerful air, and concentrated around the perimeter, in a crescent-shaped open-air park, stood, last week-end, participating aircraft—French, British, American and Swedish. These were later to be joined by machines from Italy and Spain.

Phased in with the scheduled transport services on Saturday, June 27th, were flying demonstrations by groups of light aircraft, including gliders, and on the Sunday a park of transport aircraft was at the disposition of the public.

Hillers and Bells of the Helicop-Air and Fenwick concerns were plying daily between Porte de la Villette and an enclosure on the airfield, carrying two passengers per trip at 2,000 francs a head.

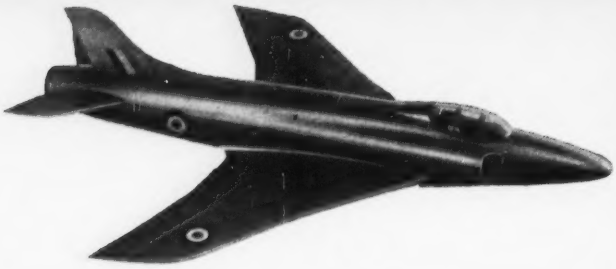
The culminating displays will take place on Saturday and Sunday, July 4th and 5th. By far the greater of the two—thanks to extensive NATO participation—will be Sunday's, when flying will continue from mid-morning until late evening. French types to be demonstrated in flight will include the S.E. Mistral, Sea Venom, Alouette helicopter and Grognard twin-jet attack machine; the S.O. Djinn helicopter, Espadon turbojet/rocket fighter, Vautour transonic attack fighter and Trident jet/rocket supersonic research aircraft; the Noratlas twin-boom transport; Dassault Mystère II and IV intercepters; Fouga C.M.170 and Morane-Saulnier Fleuret twin-jet trainers; Breguet Vultur Nene-plus-Mamba carrier-borne strike aircraft; Hurel-Dubois HD-31 transport, of extreme aspect ratio; S.E. Vampire with jet deviation; Sipa 200 Minijet; Max Holste Broussard, and the new Potez 75 armoured attack aircraft. Britain will take the air with a Hunter, a Swift, a Shackleton 2, the Avro 707A, a Provost and a Canberra; Sweden with a Safir; Italy with a Macchi 323 and an Ambrosini Super 7; America with a Bell 47, a military Hiller and a Grumman SA-16; and Spain with a Cantineau helicopter. The NATO formations will be composed of Sabres, Thunderjets, Vampires, Packets, Canberras, Invaders and—awaited with exceptional eagerness—Boeing Stratojets.

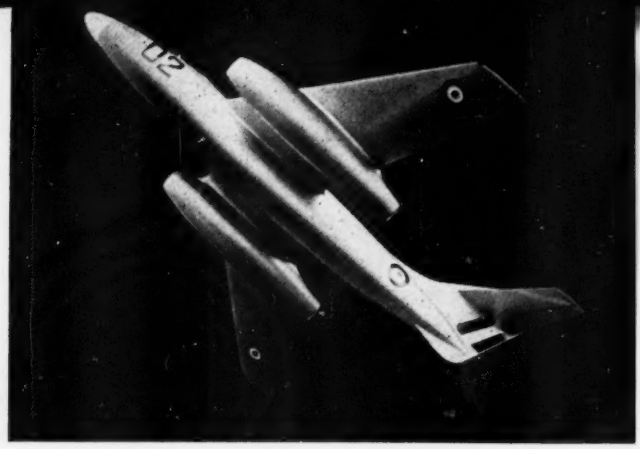
The "consecrated" days of Saturday and Sunday last were not marked by any great aerial spectacles, though the Sipa 200 gave two perfectly delightful demonstrations of its general performance and aerobatic ability. Distantly, and from certain angles, it looks and sounds for all the world like a Vampire or Venom.

Gliders demonstrated were the Emouchet SA.104, Castel CM.310 P, Caudron C.800, Castel CM25 S, Fauvel AV.36, Fouga CM.7, Arsenal Air 102, Arsenal 4.III, and Breguet 900. Light aircraft included the Sipa 901, N.C.853, Stampe, Auster, Paul Aubert, Norecrin, Brochet 100, Boisavia Mercurey, Piper Pacer, a Cessna, the Turbi and Turbulent, a Minicab, the Jodel III and Jodel Bébé.

On Sunday the big transports—once they had taken their places in the park—remained static; which was as well because continuous crocodiles of Parisiens were weaving through their interiors. Number one attraction was Air France's first Comet 1A—F-BGNX—the mirror-polished wing of which reflected the awe, interest (and beauty) of visitors. Nearby there was Air France's second Viscount—F-BGNL—of the "classe touriste"; the T.A.I. DC-6B which made the longest non-stop delivery flight in history (5,700 miles from Santa Monica, California to

Part of the scene on Sunday, June 28th, with the Air France Comet and Viscount and the Pan American Stratocruiser in line astern. On the left is an R.C.A.F. Sabre.





(Top left) Model of the Vickers-Supermarine Swift F.4. (Left) Arrival of the S.E. Grognard on Friday, June 26th. (Above) Model of the second prototype of the S.O. Vautour Atar-powered multi-purpose aircraft.

THE TWENTIETH SALON . . .

Orly, Paris); and later these were joined by an Air France Super Constellation 1049G (Wright Turbo-Cyclones) and Pan American *Clipper Constitution*. Already present were the Air France Deux Ponts F-BASS, the silver and green Short Sealand G-AIVX, the Hurel-Dubois HD-31, S.O.30P No. 15, with flush-intake auxiliary Turbomécas, Nord 2501 Noratlas No. 04 (the passenger version), Armagnac F-BAVH No. 07, with wing fences, and a Fairchild Packet of the U.S.A.F. Commercial helicopters included the S.E. *Eléphant Joyeux* (S-55) and Bristol's very handsome Type 171 demonstrator.

In this first report—a preliminary sketch of a much fuller picture—we note facts and impressions concerning the more interesting exhibits.

MILITARY and RESEARCH AIRCRAFT

Douglas B-26 Invader: A B-26 of the U.S.A.F. is shown in full operational trim, with its eight nose-mounted 0.5in guns exposed to view, six R.P.s and extra tanks under the wings, and a full bomb-bay. It is one of a squadron based at Laon-Couvron, Aisne.

Marcel Dassault Mystère IV: Since the Tay-powered Mystère was first flown on September 8, 1952, various improvements, including a longer tailpipe and a spine between the cockpit enclosure and fin, have been incorporated. The makers are preparing for the production of 225 aircraft and the first two machines of a pre-production batch totalling 17 will fly before the end of the year. The first of the true "series" should be undergoing acceptance trials in April 1954. Some machines will be powered by SNECMA Atars, the remainder by Hispano-Suiza Tays. The armament is two 30-mm guns and R.P.s, and the duration, depending on the type of mission, is between one and three hours. The undercarriage is completely different from that of the Mystère II, and is of Messier manufacture. The Mystère IVB is an Avon-powered variant which is expected to fly before the end of the year.

Marcel Dassault Intercepter: One heard of a light intercepter fighter project by Marcel Dassault. The turbojet will be a Viper, for which Dassault has acquired the Armstrong Siddeley licence. The first flight is at least two years distant.

English Electric Canberra: The Canberra in the aircraft park last weekend was a silver-finished B.2 bomber, WH732. It was more than once remarked that in general finish it was superior to the half-scale model mounted in the Hall. This appeared to have suffered in transit.

Fairchild Packet: A standard C-82 Packet of the U.S.A.F. is available for inspection.

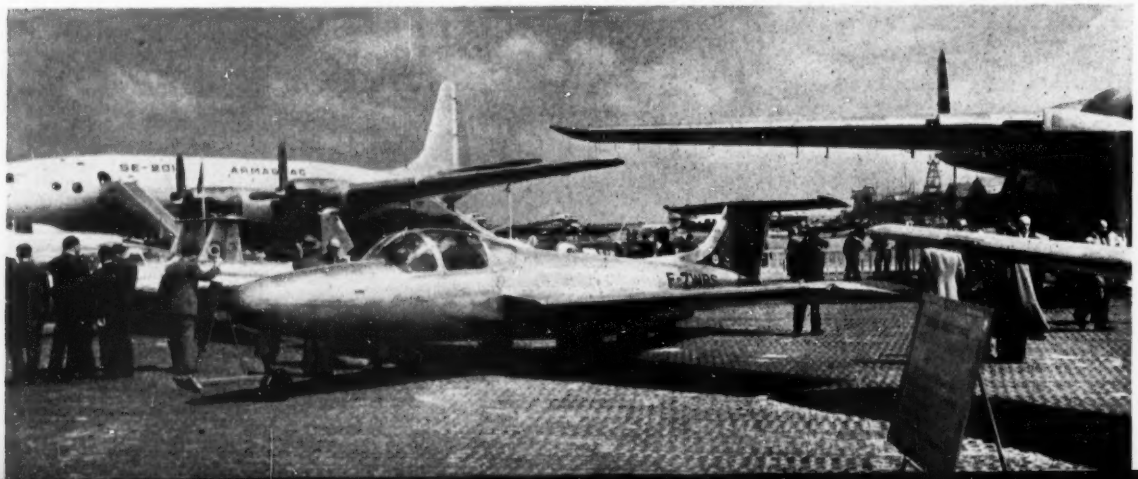
Fouga 170-R Magister: We cornered M. Mauboussin, the designer of this promising light twin-jet trainer, and M. Grangette, its pilot, and learned that development is going well. A Mach number of .815 has been attained and the French Navy is showing interest in a folding-wing version. A pre-production series of five has been ordered by the French Government and adoption by l'Armée de l'Air is considered probable. The turbojets are Turboméca Marboré IIs of 880 lb thrust each, and the latest example has a conventional tail instead of the "butterfly." This in no way reflects a change of heart; the modification has been made solely for comparative trials. The latest version also has full pressurizing equipment, provision for guns, bombs, R.P.s and auxiliary tanks, and a Hispano undercarriage. The weight is about 5,800 lb and the cruising speed some 400 m.p.h.

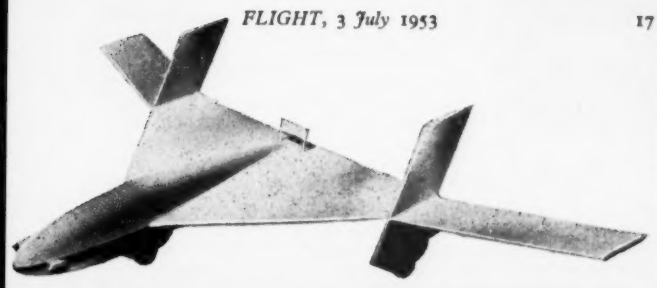
Hawker Siddeley: The excellent model aircraft on this stand (it was a pity, we thought, that the Vulcan and Atlantic were not shown to the same scale) were supplemented by some quite new and unusually interesting exhibits developed by the armaments division of A. V. Roe and Co., Ltd. The triple bomb carrier (Avro No. AV.151) takes three 1,000 lb bombs and is hoisted bodily, with the bombs in place, into the bomb-bay. There is also a flare-launching tube (AV.190) with hand or relay release. The armament division is concerned with bomb carrier releases, automatic selectors, multi-cellular flare tubes, bomb hoisting gear, and bomb trolleys.

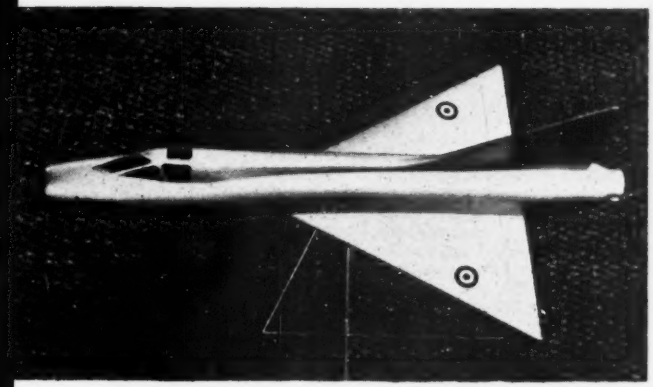
Air Service Training show a model of a towed target—a tailless design evidently capable of high-Mach operation. It has a spoiler on the trailing edge to deal with trim changes and a fixed, faired tricycle undercarriage.

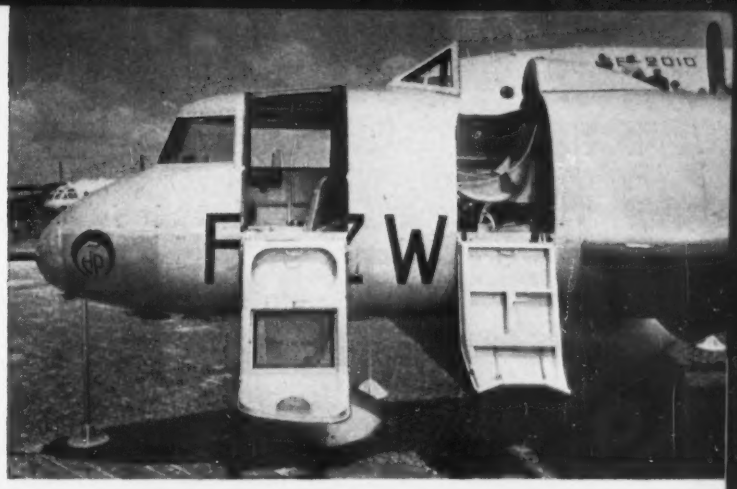
Morane Saulnier 755 Fleuret: This fascinating twin-jet, all-metal trainer was parked alongside its equally appealing rival, the Fouga CM.170R. The prototype first flew in January this year, and the cruising speed, with two Turboméca Marboré IIs, is quoted as 403 m.p.h. All services are electrical, with manual operation for emergency, and emergency exit is effected by tipping the seats backwards and dropping their occupants (who are seated

Morane-Saulnier Fleuret twin-jet trainer.









(Top left) A.S.T. target-glider. (Above) Internal accommodation of the Potez 75. (Left) Model of the S.E. Durandal intercepter.

side by side) through a floor hatch. The armament is two MAC 7.5-mm machine-guns with 400 rounds each, two Alkan bomb carriers, two Matra M.3 rocket mountings, two Type 4E gyro gunsights, and a Facine F.72A camera gun. The limiting Mach number for normal flying is quoted as 0.8 and for bombing training 0.7. The span and length, respectively, are about 31 and 32ft, and the gross weight is 5,490 lb.

Morane Saulnier 733 Alcyon: The specimen on view is No. 9 of a production batch of 100 now being constructed at Tarbes. Its cowling bears the inscription "Centre d'Expériences Aériennes Militaires." The design dates from five years back, when the French Air Force organized a competition for two three-seat all-metal trainers. The Morane entry was the M.S.730, powered with a Mathis G8R engine of 190 h.p. and which flew in August 1949. This was followed by the M.S.731, with a 240 h.p. Salmson, and the M.S.732, likewise Salmson-powered but strictly a two-seater. The M.S.733 flew in September, 1951 with a Potez engine, and finally was declared the winner of the competition.

Nord 856A: Two examples of this air O.P. monoplane are displayed—one in the hall and one in the aircraft park. The prototype flew in March 1951, and a batch of 110 is on order for the French Armée de Terre. Visibility is of a quite exceptional order. Cruising speed with a Regnier engine of 135 h.p. is 105 m.p.h., minimum speed 43 m.p.h., and gross weight 1,950 lb. It is interesting to observe that a v.p. airscrew is considered worthwhile, although this refinement is not favoured in comparable Auster types.

Nord 2501 Noratlas: The specimen statically displayed is No. 04 and is equipped for passenger work. Place-names of the extensive South American tour undertaken by this aircraft are inscribed on the fuselage. With two Bristol Hercules 739 engines, giving 2,040 h.p. for take-off, the Noratlas cruises at 210 m.p.h. Seventy-five of these machines are on order for the French Air Force and the type has also been adopted by Brazil. Gross weight is 42,990 lb.

North American Sabre: A Canadian-built F-86E Sabre of the R.C.A.F. is on display. Last Sunday it ascended to 43,000ft and made a faint supersonic boom before demonstrating at lower levels.

Potez 75: In the 15 days following its maiden flight this piston-engined light ground-attack aircraft made 25 flights. From a French source we learn that it can be considered as "a perfected motorized ground weapon, but cleared from road servitude and faster and more mobile than the usual rolling ones." It is mainly intended for attacking, from very low level, enemy armour which has advanced into home territory, and its main weapons will be guided missiles, aimed by an observer seated in a heavily protected nose cockpit. Of simple and sturdy construction, its flying qualities are said to be such that the average private owner would feel quite at home. The machine has, in fact, been described as a "home guard" weapon, and the makers foresee *groupes aériens de terre* (ground support air formations) established at low cost. The construction is all metal, the span 43ft and the gross weight 5,290 lb.

Republic F-84 Thunderjet: A standard F-84 Thunderjet of the U.S.A.F. is available for inspection.

Sipa S.12: A specimen of this familiar tandem-seat trainer (No. 47) is one of a batch of 50 built for the French Air Ministry. Its predecessors were the S.10 and S.11, and of the three models a total of 231 has been ordered or delivered. The gross weight is 5,017 lb and the engine a SNECMA Argus 12S023H of 580 h.p.

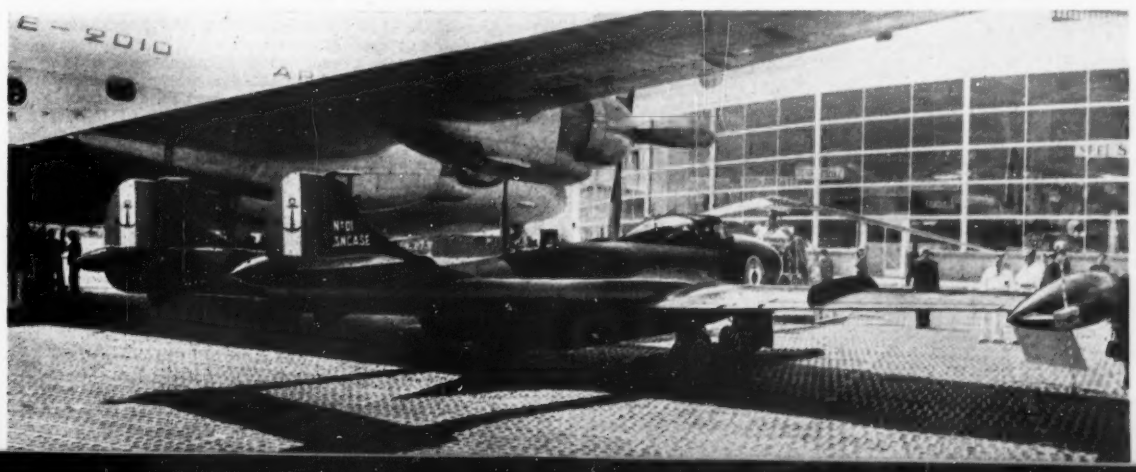
Sipa Trainer Project: A model shows a light trainer with tandem seats, root intakes and a jet outlet beneath the fuselage.

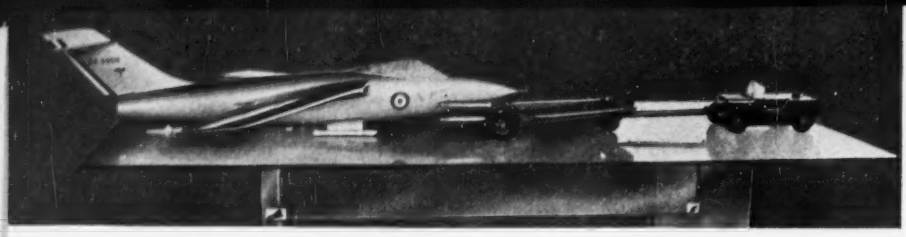
S.E.2410 Grognard: The Grognard shown is the earlier of the two prototypes, to which reference was made last week and, having a more sharply swept wing than the S.E.2415, achieves a higher speed. Figures quoted to us were a Mach number of 0.84 and a speed of 652 m.p.h. at sea-level, and a Mach number of 0.86 and 590 m.p.h. at 29,500ft. A typical armament would be two 30-mm guns with 200 rounds each and—internally stowed on a retractable framework—40 rocket projectiles of the T.10 type, or 200 of the Air-Sol 4 kg pattern. The rate of fire is said to be 1,800 a minute. It is calculated that with two Hispano-Suiza Tays the range for the ground attack mission would be 465 miles. With escort-fighter equipment and armed with two 30-mm guns with 120 rounds each, a range of 1,860 miles should be attainable.

S.E.5000 Baroudeur: One learned on the S.E. stand that this unorthodox ground-attack aircraft, the first description of which appeared in the preceding issue of *Flight*, should fly within a few days at Istres or Marignane. The pilot will be M. Maulandi. The method of mounting the aircraft on its rocket-propelled take-off trolley was described last week, and a model in the Salon illustrates this procedure.

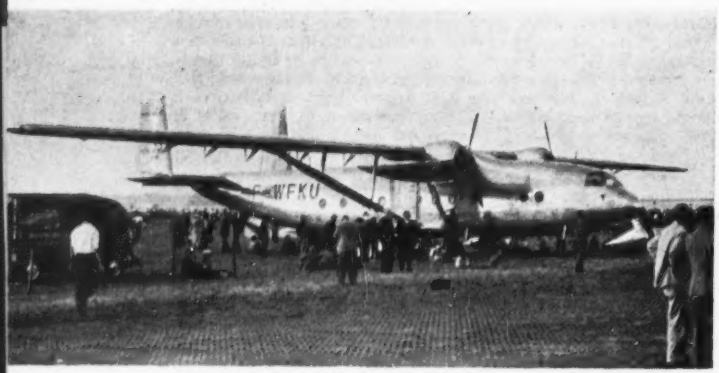
S.E. Durandal: A model of this light, delta-wing, supersonic

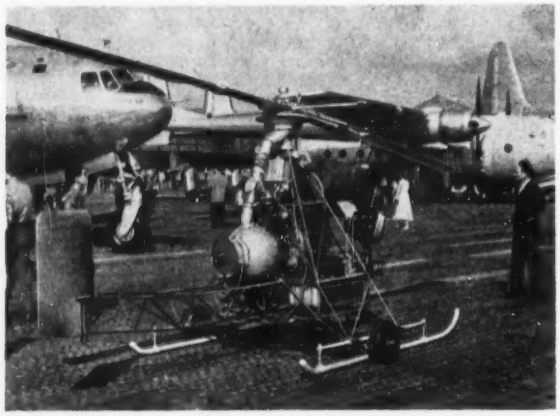
S.E. (de Havilland) Sea Venom, with modified tail.

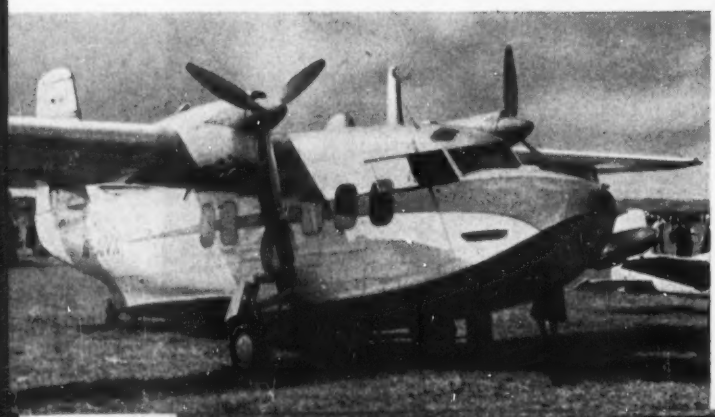




Model demonstrating how the S.E. Baroudeur is mounted on its rocket-propelled take-off trolley.







THE TWENTIETH SALON . . .

intercepter, the prototype of which should fly in 1955, is shown. Strongly resembling the Boulton Paul P.111, it is designed for a Mach number of 1.4. The turbojet has an afterburner.

S.E. Mistral: Statically shown is Mistral No. 106. The placard speed is 574 m.p.h. An ejector seat—of S.O. type—and a Hispano Nene turbojet are but two of the features which distinguish this fighter from its precursor, the Vampire 5.

S.E. (de Havilland) Sea Venom: Seventy-five Sea Venom deck-landing night fighters are in production for the French Navy and two examples are displayed, one (No. 03) with the original tail, and a second (No. 01) with modified fins and rudders. Although the performance of the Sea Venom is supposedly secret in this country, the speed is placarded at Le Bourget as 602 m.p.h. and the rate of climb as 8,640ft/min. Machine No. 03 is displayed with eight R.P.s.

S.F.E.C.M.A.S. 1402: This supersonic delta-wing fighter, built in the light of experience with the Type 1301 glider, is now under assembly at Chatillon and the first flight should take place late in the summer. An Atar 101-C is installed and the control surfaces, except the rudder, are actuated by Jacottet irreversible servo controls. Dive-brakes are fitted at the rear of the fuselage. "Special modern armament" is intended for this machine.

S.O.4050 Vautour: A model of the second prototype of this twin-jet, swept-wing fighter/attack/reconnaissance aircraft is shown, and the first prototype should fly in the final displays. Speeds of sonic order in level flight are predicted for later developments.

S.O.9000 Trident: This high-speed research machine, some preliminary details of which were given last week, is shown in model form. It is expected to be the first French aircraft to achieve supersonic speed in level flight. Extensive use is made of "sandwich" construction.

Vickers-Supermarine Swift F.4: A very beautiful model of the Swift Mk F.4 is perhaps the greatest attraction on the Vickers-Armstrongs stand. The leading edge "kink" is more pronounced than on earlier marks, leading to the speculation that ammunition for two additional 30-mm guns might be disposed therein.

TRANSPORTS and HELICOPTERS

Breguet Super Deux Ponts: This project is a direct development of the Breguet 763 as used by Air France, but will have a pressurized double-bubble fuselage. Intended power plants are Wright Turbo-Cyclones or Pratt and Whitney Wasp Majors. Top speeds of the order of 400-435 m.p.h. should be attainable.

Bristol 173 Mk 3: A 1/24th scale model of this twin-rotor helicopter, displayed on the Bristol stand, shows the two small wings, attached fore and aft. The maximum speed is quoted as 152 m.p.h., the weak-mixture cruising speed as 138 m.p.h., the empty weight as 9,298 lb, and the gross weight as 13,498 lb. A 14-passenger version is mentioned, with provision for 25 lb of baggage per passenger, a stewardess and a toilet.

Fokker Development: The Fokker company has recently passed completely out of Government control, all preference shares and a batch of "ordinaries" having now been sold to a combine of Nederlandse Handel Mÿ and Wilton-Feyenoord (owners of shipyards at Rotterdam which are among the largest in Holland). This group is in process of electing a new board of directors who will in turn appoint a new Fokker management.

Fokkers are at present building two of their Friendship transports to K.L.M. order with the aid of a government development contract, approved by both government chambers but subject to a formal order to proceed from the N.I.V. (technical aircraft development committee). The Friendships are to have two Rolls-Royce Dart R.Da 5s of about 1,650 e.h.p. and fitted with a new reduction gear and Rotol airscrews.

The reason for the absence from Paris of the Fokker Mach Trainer is that important N.A.T.O. trials are to be undertaken in September with a Nene engine, and the work of installation is now being carried out.

Grumman Widgeon: The licence for this amphibian is held by Aéronautique Legastelois, who quote figures for versions with Gipsy Queen IIs and Gipsy Queen 30s. With the first-named

Under the Baroudeur: (top to bottom) M. Mauboussin (left), designer of the Fouga C.M.170R, with its pilot, M. Grangette; the Hurel-Dubois HD-31, to be demonstrated next week-end by M. Fitch; the S.O.1220 Djinn experimental helicopter and the Short Sealand demonstrator.

engines the maximum speed is given as 174 m.p.h., maximum cruising speed as 160 m.p.h., and range as 644 miles at 149 m.p.h. Corresponding figures for the Gipsy Queen 30s are 192 m.p.h., 174 m.p.h. and 615 miles at 164 m.p.h.

Hiller helicopters: In addition to the air-taxi machine a Hiller is statically displayed by the French Air Force. It has served in Indo-China since 1950 and has evacuated 618 casualties.

S.E.55: This is the S.E.-built Sikorsky S-55 and has been dubbed the *Eléphant Joyeux*. A series of these helicopters is under construction in France.

S.E. Helibus: This is the name of a projected helicopter powered with two turbines, carrying 30 passengers, and utilizing S-55 rotors and rotor heads. The machine strongly resembles the Bristol 173 but has no wings, as has the Mk 3 version of that type.

S.E.3120 Alouette: This three-seater helicopter made its first flight on July 31 last year. The second prototype is displayed. All tests have been completed at the Bretigny centre, and the machine was described to us as being perfectly *au point*. The engine is a Salmson 9NH and the gross weight 2,778 lb.

S.O. 30P Bretagne: The example shown is fitted with two Turboméca Palas auxiliary turbojets, very neatly faired and mounted under the outer wings, and having flush intakes.

S.O.1220 Djinn: This little experimental helicopter first flew on January 2 this year and is being used as a research vehicle for the S.O.1310 Farfadet "convertible." The rotor is driven by compressed air supplied by a Turboméca Palouste; there are no combustion chambers as on the earlier S.O.1120 Ariel. The rotor is said to be almost noiseless, and the makers claim that the fuel consumption is less than one-third of that of a ramjet helicopter of equivalent performance. The exhaust of the Palouste is deviated to provide manœuvrability in stationary flight. Although the prototype is a single-seater, a two-seat version is planned with duration of about ¾ hr. The gross weight will be about 1,100 lb, the hovering ceiling 3,200ft and cruising speed 62 m.p.h.

LIGHTWEIGHTS

S.I.P.A. 200 Minijet: Having flown itself busily into first place in the spectators' affections, this unique little jet formation-trainer deserves to open our notes on the light-aircraft group. Attractive, all-metal, Palas-powered (330 lb static), the Minijet, according to French translation, has an ovoid box-car fuselage.

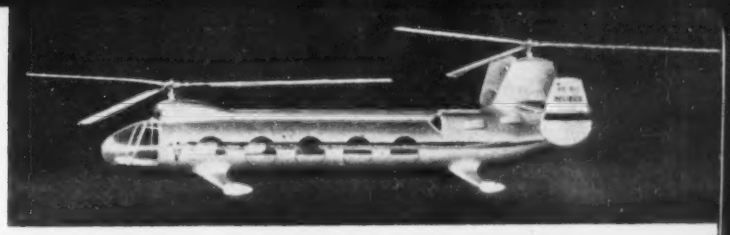
The machine first flew in January 1952. As has been demonstrated on several days during the week, it is most lively and, when flown solo, fully aerobatic. Span, length and height are respectively 23ft 8in, 16ft 11in and 5ft 10in. The empty weight is 810 lb, the all-up weight 1,173 lb and the wing loading a fraction over 16 lb/sq ft. The Palas needs 22 gallons per hour of kerosine, but in return gives a cruising speed of 236 m.p.h. Maximum speed is 267 m.p.h. and rate of climb, 1,140 ft/min. The best range obtainable is over 400 miles, and the take-off run required is about 400 yards. From the same S.I.P.A. stable comes the 901, a familiar light two-seater with distinctive transparent cockpit enclosure.

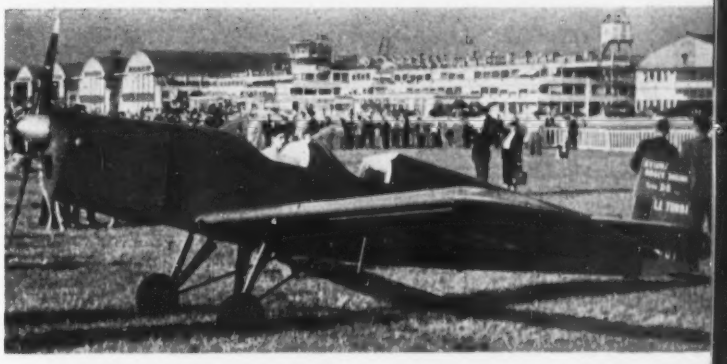
Jodel: Two entirely sensible lightweights—cheap, safe and easy to fly—are displayed and demonstrated by Société des Avions Jodel, founded a few years ago by Messieurs Joly and Delemontez. The Bébé Jodel, or D.9, is by no means new, and, in fact, together with the D.112 which it so obviously resembles, has been sold in kit form to some 150 amateur constructors, and under licence to concerns in Germany, Belgium and Italy.

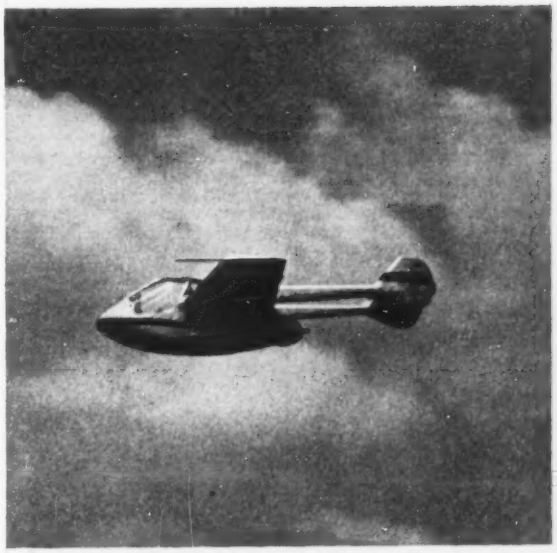
The Jodels have pronouncedly upswept wing tips and the simplest of wooden constructions. The D.9 at Paris is powered by a 44 h.p. Lutitia 4C.02. This typically French four-cylinder vee two-stroke unit is described as "I.C.A.O. approved." An earlier Bébé had the 26 h.p. Volkswagen engine installed, while there are plans, with economy in mind, to have 28 h.p. Gillet motor-cycle engines in the future. The span is 22ft 11in and the weight, all up, according to engine, is from 550 to 600 lb.

Druine: Enjoying the slightly putting-off names of Turbulent and Turbi, another pair of lightweights are causing considerable interest among the Parisian public. The Turbulent D.3 is a comparatively shapely single-seater in which, however, the designers have not lost sight of the essentials of simplicity and economy. It has a Volkswagen engine of the four-cylinder opposed type. The wings carry fixed slots of the same span as, and exactly lined up with, the ailerons.

The Turbi D.5 might be described as of simplified Moth Minor conception. Of the several engine possibilities the Beaussier four-in-line unit of 50 h.p. has been selected for the aircraft at Paris. Representative figures are landing speed 40 m.p.h., cruising speed

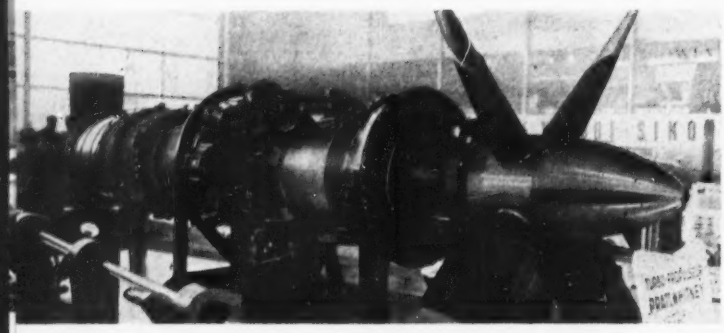






From top downwards are: Model of the S.E. Helibus, which is designed to use S-55 rotors and rotor heads; Druine D.5 "Le Turbi"; Jodel D.9 Bébé; a fast passage by the Sipa 200 Minijet; and the Druine D.3 "Le Turbulent."

Fauvel AV.36 glider.



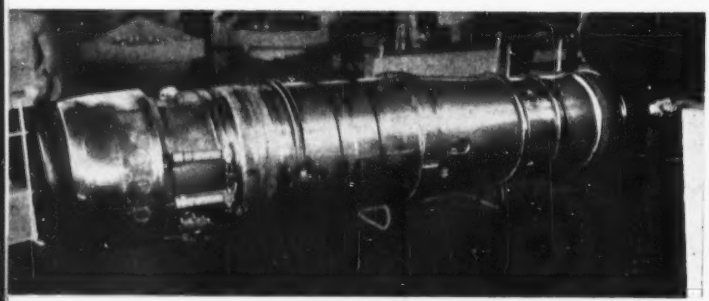
Pratt and Whitney PT2F-1 (T-34) turboprop.

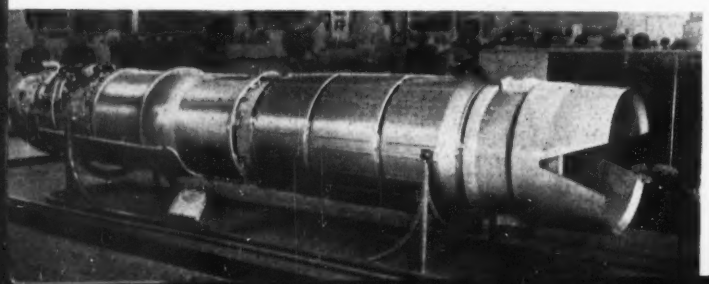
75, max. permitted speed 112, duration 4½ hr. The "flying" weight is 1,065 lb and constructor's drawings cost £10.

Cessna: By comparison with the wooden lightweights, the American Cessnas, handled in France by Air-Touriste de Paris, are Rolls-Royces of private-owner aircraft in appearance, equipment and price. Beautifully finished versions of the 195 (300 h.p. Jacobs radial) and of the smaller 180 (225 h.p. Continental) must be whetting many pilot appetites in Paris. In Europe one seldom sees such refinement in aircraft in this weight and performance class, but this is not surprising, for the four-seat, 150 m.p.h. Model 180 costs $12,950 bare ex-works.

Piper: Another American manufacturer showing at Paris is Piper, whose Pacer 135 four-seater also displays a refinement of design, finish and equipment indicative of considerable customer experience and large-scale production. It has a Sensenich metal airscrew for its flat-four 135 h.p. Lycoming.

Boisavia: This company's high-wing four-seat 601 is now quite well known, and thus of greater interest this year is the fuselage mock-up of a new wooden twin in the Miles Aries class. To be known as the Anjou B.260, it is the subject of an official order for prototypes, and a first flight is planned for October this year. With Gipsy Majors it would be a 4/5-passenger type, or with 185 h.p. Continental six passengers could be carried. With these engines respectively maximum speeds are estimated as 170 and 187 m.p.h.; ranges, 930 and 1,250 miles; single-engine ceilings, 6,500ft and 9,200ft; all-up weights, 3,420 lb and 3,815 lb.





Afterburner for Rolls-Royce Avon. (Below) Atar 101F with afterburner.

THE TWENTIETH SALON . . .

Saab Safir: Providing a pleasant contrast with all other light aircraft was the squat Netherlands-built Safir in an unusual but attractive yellow, white and beige livery. Since this lively, metal, aerobatic three-seater was first seen out of its native Sweden, a 190 h.p. Lycoming flat six has replaced the original Gipsy Major, and there has been much detail refinement. The de Schelde Safirs retain the Hartzell v.p. airscrews, and radio a standard,

ENGINES

Armstrong Siddeley. The engines displayed on the Hawker Siddeley Group stand were the Sapphire, Snarler and Double Mamba, as shown at Farnborough last year. Additionally, the exhibition Viper was present on the stand of Marcel Dassault, who now hold a production licence.

Bristol. On the Bristol stand were the superbly sectioned Hercules, Centaurus, Proteus and Olympus, which were also shown at Farnborough last year.

Curtiss Wright. By an interesting coincidence, the Wright J-65 Sapphire was exhibited immediately adjacent to the British Sapphire on the Armstrong Siddeley stand. Many superficial differences between the engines were apparent, and we were told by Curtiss Wright that the engine on their stand was manufactured entirely by them. They also showed a fully sectioned Turbo-Compound piston engine, of the type which is going into French service in the Lockheed Neptune and Super Constellation.

De Havilland. A completely new development was the four-blade airscrew, developed for turboprops of up to 1,800 h.p. With a diameter of 10ft 6in, the exhibition model had solid duralumin forged blades, without de-icing. De Havillands also showed a sectioned civil Ghost power-plant (of the type which could also be heard throughout the Salon in service with Air France and U.A.T.).

Pratt and Whitney. One of the most instructive, and most unexpected, of all the exhibits in the Salon was the big turboprop, previously known by its U.S.A.F. title of T34, and exhibited as the PT2F-1. Clearance for its public exhibition was, in fact, only obtained a few days before the Salon opened. In view of its guaranteed performance—the sea-level take-off power, for example, being 5,600 e.s.h.p.—the engine is of amazingly small diameter. The maximum diameter is, in fact, just over 34in, and the axial compressor itself is very much slimmer than this.

Power is not obtained by excessive speed, for the maximum r.p.m. are no more than 11,000; the only weak feature of the engine appeared to be its specific fuel consumption, which is given as 0.77 lb/h.p./hr at 60 per cent power at sea level. The engine has been flying in the nose of a B-17 for two years, and will shortly take the air in modified versions of the Super Constellation and Globemaster.

Rolls-Royce. The three major exhibits on the Rolls-Royce stand were a Dart RDa.3, an Avon and an Avon afterburner. Each of these was being shown for the first time. The Dart was of the fully modified pattern with shrouded turbine blades, these blades being machined from solid Nimonic blanks.

The Avon was a production RA.7 with full thermal de-icing, and it showed numerous other features not present on the Avon seen at the last S.B.A.C. show. The Avon afterburner was also a standard production job, and it was exhibited without blanking caps, but with the burners removed. Two eyelids are fitted to the outlet, electro-hydraulically positioned to either the "shut" or "opened" condition.

S.N.E.C.M.A. Dominating this large stand was the immensely lengthy Atar 101F turbojet with afterburner. This is the latest and most powerful of all the Atars, and gives 8,370 lb thrust at sea level. Also shown was an earlier Atar variant in fully sectioned form, which indicated that many of the features of the original B.M.W. axial turbojets of 1945 have been retained in these French developments.

Of particular interest was a new S.N.E.C.M.A. pulse-jet, the Ecrivisse. This differs from the earlier Escopette in a number of essentials, notably in that both intake and jet nozzle now face aft, the whole engine thereby gains by being shorter and lighter. The Ecrivisse weighs, in its first form, 13 lb, and gives 44 lb thrust.

S.T.A.L. This famous Swedish firm exhibited their axial turboprob, the Dovern II, for the first time. Although, for various reasons, this big and fully developed unit has now been abandoned by the Swedish Air Ministry in favour of the Avon, it has many interesting features. We noticed many items by Lucas or Rotax around the Dovern, which is stated to develop 7,270 lb thrust at sea level at 7,200 r.p.m.

Turboméca. Among the range of small gas turbines on this stand, the Marcadau was of particular interest. This is a small turboprop of 400 h.p., which is to be fitted in the Farfadet convertiplane. The air enters through vertical slots about half-way along the engine, forward of which is the massive-looking airscrew gearbox.

Hispano Suiza. This long-established company exhibits—in addition to piston engines—turbojets indicative of its close co-operation with Rolls-Royce but also bearing unmistakeable evidence of individual Hispano development. There was much reference at the Salon to the completion of arrangements for the licence to build Avons—R.A.7s in the first place, with civil 9s to follow, we were told. Only a few days before the Salon opened, the Hispano Tay, known as the Verdon, had achieved a 30-hour run at 7,700 lb thrust following a preliminary run at 7,300 lb. This unit is next to be developed in conjunction with Hispano's R 450 afterburner (single-lever electro-magnetic pilot control) massively exhibited on the stand. Test-result figures mentioned for reheat are 35 per cent static sea-level thrust increase on the 5,100 lb Nene for a specific consumption of 2.1. The Hispano Tay will with the same reheat give 9,900 lb for a slightly greater consumption. The 7,700-lb Verdon will fly next month.

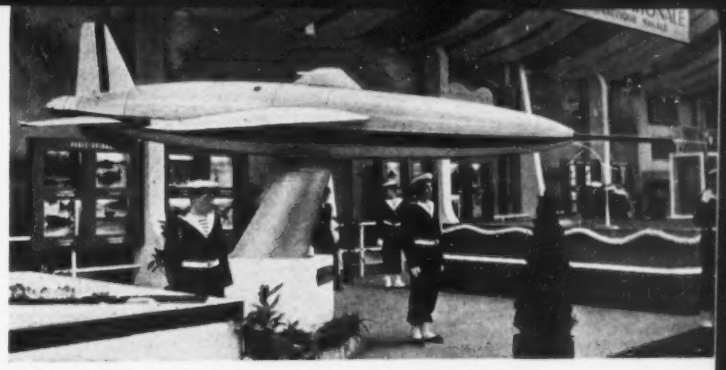
OTHER EXHIBITS

Aéronautique Navale: The French Navy displayed a sectioned test missile developed by the Ballistic and Aerodynamic laboratory at Vernon. Generally resembling a V-2, this vehicle had a bi-fuel (nitric acid and gas-oil) rocket, the tanks being pressurized by a gas generator. In the nose was a parachute, together with a radio transmitter for telemetering test data.

Another item on this stand was a black-and-yellow air/surface vessel glider-bomb, controlled by radio from the launching aircraft. The only control surface appeared to be the rudder (the tailplane was fixed) but each wing carried novel air brakes running out on rollers perpendicular to the wing surface. The design is clearly for a subsonic weapon.

Bendix: Among a wide range of exhibits from the various divisions of this combine was an autostabilizer, shown by Bendix-Frize Instrument division. This equipment was developed jointly by the R.A.E. and Elliott Bros. (London) for a number of high-speed aircraft.

Sir George Godfrey and Partners had on their stand an example of their two-stage cabin blower of the type (5/20/25) fitted to the record-breaking Olympus-Canberra. This Rootes-type blower is only slightly larger than the well-known Type 15, and has operated perfectly at over 60,000ft on a number of Bristolian occasions.



Flying bomb on the Marine Nationale, Aéronautique Navale, stand.

H. M. Hobson had an impressive range of fuel control units for the Sapphire, Double Mamba, Python, Goblin, Centaurus and other engines, as well as specimen power-control components.

S.A.M.M.: This French firm displayed an electrically-operated gun turret mounting two British Hispano 20-mm Mk V cannon. The turret appeared very cramped for direct control, and the sight was the well-known Mk V British gyro-gunsight.

Standard Telephones showed their V.O.R. receiver type S.R.31, with the exceptionally neat pilot presentation indicator. Six of these V.O.R. sets are to undergo service trials with B.O.A.C. and the M.C.A.

Rotol: In addition to a Comet auxiliary gearbox, Rotols showed a very fine sectioned Double Mamba airscrew and an example of the airscrew developed for the Breguet Vultur. The Gannet airscrew had not previously been seen in fully sectioned form. The Vultur unit, driven by a Mamba, greatly resembles that used by the Viscount but, *sans* electric de-icing, does not have the straight leading edge characteristic of the company's composite blades.

THE A.F.I.T.A. CONGRESS

Mr. W. E. W. Petter's Paper on Light Fighter Design

ON the occasion of the Paris Show, an international aeronautical congress, organized by A.F.I.T.A. (l'Association Francaise des Ingénieurs et Techniciens de l'Aéronautique), was held between June 29th and July 2nd. At this meeting, 48 papers were due to be presented by technical experts from both French aircraft companies and those of other countries. Among the papers, to which we hope to refer at greater length in a subsequent issue, were six by British engineers: *Some Problems in the Design of High-Speed Aircraft and Theoretical Methods of Solution*, by B. A. Hunn (Hawker Aircraft); *Design for Production*, by W. E. W. Petter (Folland Aircraft); *The Transition from Prototype to Production in Aircraft Manufacture*, by W. S. Hollyhock (Hawker Aircraft); *High-Strength Light Alloys*, by A. Black (Vickers-Armstrongs); *Integral Construction*, by E. Keen (Armstrong Whitworth Aircraft), and *New Materials and Methods for Aircraft Production*, by H. J. Pollard (Bristol Aeroplane Company). The last two papers listed have been presented before the R.Ae.S.

We present first in slightly abridged form the paper by Mr. Petter of Follands, in which the author emphasizes that lightweight design is the key to large-scale production. In view of his company's work on the Gnat, the paper is of special interest.

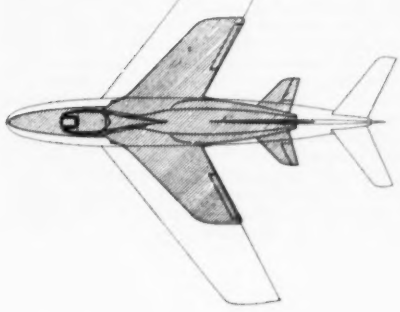
Much could be done by a good basic layout and detail design, Mr. Petter began, to achieve simplicity and low cost, but when competent designers were strictly fulfilling a given requirement, the final difference of cost or of man-hours would amount to only some 20 per cent. Amounts of this order, however, could not effectively solve the problems of today. Costs of fighter aircraft had risen so that it was impossible to build large numbers at all and, indeed, the development of manufacturing techniques required an ever-larger number of complex machines. It was proposed, therefore, to make a brief examination of the benefits which could derive from producing an aircraft of much smaller size in very much larger quantities. The distribution of weight between large and small machines would then be examined, and it would be found that, although the small machine could and must be a better load carrier, this need not be at the expense of power. Performance must on no account suffer.

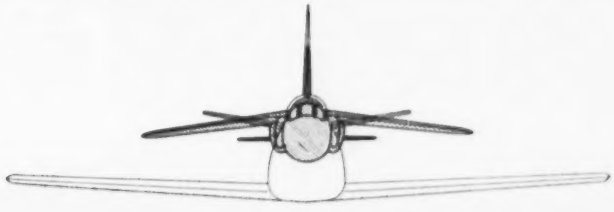
For purposes of comparison, a small fighter aircraft weighing some 2,500 kilos (5,500 lb) would be assumed, and compared with a contemporary design of a more normal weight of 7,500 kilos (16,500 lb) (a size comparison is given in Figs. 1 and 2).

Assuming that there was an overall sum of £6 million to be expended, the number of each type of machine which could be produced for this sum could be determined. The cost in man-hours of the two types as production proceeded was then discussed (see Fig. 3). For the larger machine an 80 per cent decrement on the man-hours curve and a production number of 200 had been assumed. In the case of the light fighter, of which 1,000 were to be produced, an 80 per cent curve had been used up to the 500th aircraft, and a reduced rate of decrement of 90 per cent from the 500th aircraft onwards.

From the curves, the benefit of large-scale production was apparent. It could be ascertained that the average man-hours for the large machine at the 10th and 200th aircraft were respectively 75,000 and 28,300, comparing with 25,000 and 9,450 for the smaller aircraft. At the 1,000th small machine, the average man-hours had been lowered to 5,750, i.e., one-fifth that of the 200 large machines.

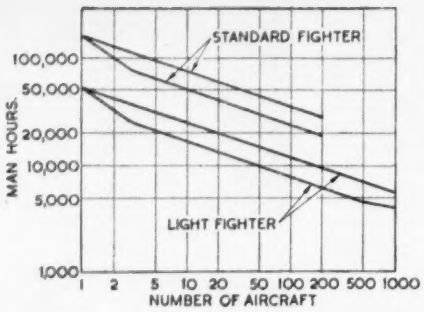
Concerning unit costs, it was worthy of note that those of the last





Figs. 1 and 2. A comparison between a conventional modern fighter (the Sabre) and the lightweight fighter discussed in Mr. Petter's paper. Some similarity to the Folland Gnat, though not mentioned, may be inferred.

THE A.F.I.T.A. CONGRESS



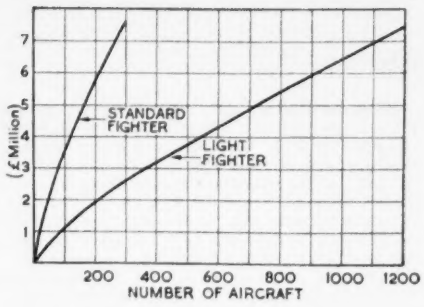


Fig. 3. (Left) Production comparison, showing man-hours required per aircraft for both types of fighter, for production numbers up to 200 and 1,000 respectively. Fig. 4 (Above) Cumulative total costs (including material) of the standard and light fighters (airframes only). For £6 million, 215 standard or 900 light machines could be built.

machines in the two contracts was £21,000 and £5,350 respectively. When cumulative total costs were plotted against numbers (see Fig. 4) it was seen that, for the £6 million, one could obtain either 215 of the large machines or 900 of the smaller type. The remarkable conclusion was that, although the large aircraft was three times the weight of the smaller one, it was possible to produce for the same outlay of man-hours five times as many of the small aircraft as of the larger aircraft. In terms of total cost, the ratio would still be more than four to one.

It might be asked, however, how it was possible while achieving an equal performance to carry an effective useful load in so small a machine. An analysis of the weight distribution, however, showed that the useful load carried (i.e., fuel and military load) was approximately 42 per cent for the small machine against 33 per cent for the larger aircraft. This striking conclusion could be attributed to three important factors, namely, the structure, the engine and miscellaneous services, all of which could be lighter for the small machine without sacrifice of performance or strength.

The structure, weight and complexity of the light aircraft considered showed considerable reductions over the larger aircraft, particularly in the wing design. For instance, the undercarriage could be retracted into the fuselage, thus avoiding discontinuity in the main load-carrying part of the wing structure (that had made so many wing designs so difficult and heavy), and it was found that adequate space was available in the fuselage for the required fuel stowage. Hence, the only discontinuity from tip to tip was the inevitable change of direction due to sweep-back.

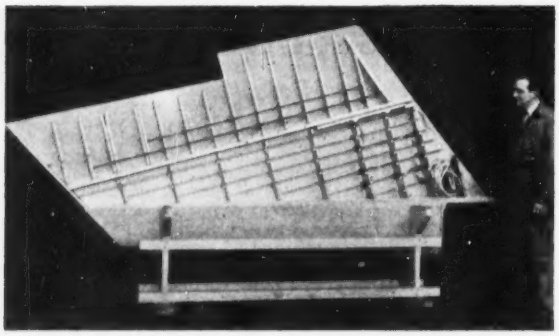


Fig. 5. Adequate strength and stiffness for the light fighter wing can be provided by this simple type of construction. Using separate stiffeners, production is cheaper and easier than by means of integral stiffeners, used in larger wings.

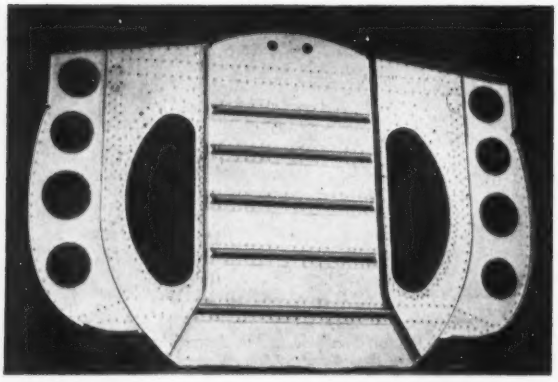


Fig. 6. Pressed sheet metal parts can be used in the light fighter in place of built-up assemblies embodying castings and forgings. An example is this frame, a basic one-piece metal item supporting the front wing attachment.

Adequate strength and stiffness could be provided by a wing construction in which skins were stiffened by separate stiffeners, a much cheaper and easier method than those involving the integral structures now used for larger wings. A considerable saving in manufacturing man-hours could be achieved by replacing sub-assemblies by single parts. It was obvious that the reduction in size made the application of this principle much easier. Because of these and similar simplifications, it had been found possible to design a structure weight of 30 per cent compared with almost 35 per cent on the large machine.

It was undoubtedly possible to produce a light-weight engine, that is, one having a very high thrust/weight ratio with somewhat less emphasis on consumption, in the small size, and a figure of 5 lb of thrust to 1 lb weight was realizable with a reasonably long life. An improvement on the present figures of approximately 3 lb of thrust per lb of weight for the large engine was also possible, although perhaps not to the same extent, but the great cost of developing such large engines made it inevitable that a compromise solution be produced. Were full advantage taken of this power-plant gain, the difference in power-plant weight would be greater than that between 16.5 per cent and 20 per cent as at present shown.

It had been proved that a high compression ratio, necessary for long endurance, was not essential in fighters and, equally important, the extremely low cost which could be realized when very large numbers of engines were made had been demonstrated. A cost ratio of 1 : 10 was not unusual.

Finally, the small machine could benefit from a more than proportional simplification of its services, i.e., the hydraulic, electric and other systems which were an ever-increasing burden on a large machine, not only in manufacture, but also in servicing. Comprehensive examples of the simpler hydraulic, fuel and pressure cabin systems of the small aircraft were then given by Mr. Petter. Concerning equipment, he said that one would, of course, like to reduce the amount of equipment proportionately with the size of the machine, but since the object of the fighter was to fight, there was a limit below which further reduction of equipment could not be performed. This limit would comprise two 20- or 30-mm guns, or four 0.5-in guns with reasonable ammunition, adequate wide-range radio facilities, some form of navigational aid, and possibly provision for radar gun ranging as an overload. It was agreed also that an ejector seat would be necessary, although even here substantial weight-saving could be achieved compared with what had been common practice, firstly, by good engineering design, and secondly by the use of a reasonable ejection velocity suitable for fighters, rather than a general-purpose high-velocity which might be necessary for larger machines.

A useful load of some 1,000 kilos (2,200 lb)—about 40 per cent of the all-up weight—would cover all the above essential military load, including the pilot, together with a good internal fuel allowance, and we were led to the surprising conclusion that the small machine was a better carrier of useful load than the larger aircraft. Admittedly, this derived in part from the employment of a more up-to-date—or at least specialized—engine, which, however, economics and time would probably prevent from being available in a larger size for the large fighter. Mr. Petter concluded: "It is hoped we have shown that a major contribution to a reduction of cost can be achieved, and at the same time a practical fighting weapon can be designed which will meet, if not all, a great many of the requirements for the operational functions of a day fighter.

"We found that four or five times as many machines can be produced for a given cost, which makes possible efficient production in many countries which might otherwise not be able to contribute to their own and NATO defence."

An Auster A.O.P.6 of No. 1903 Independent Air O.P. Flight over the lines. Enemy earthworks can be made out among the shell and bomb craters.

THE SHARP END

Britain and Australia in the Korean War . . . Part 3

By H. F. KING, M.B.E.

IN this final instalment of the assistant editor's account of his Far Eastern journey he describes his visits to Nos. 1903 and 1913 Flights in Korea. In an Auster of "1913" he spent some time above and beyond the enemy lines, and he has an exciting story to tell of Communist flak and of its summary suppression by Commonwealth artillery. At the close of his story he writes of his meeting with S/L. Graham Hulse, D.F.C., an R.A.F. pilot attached to a Sabre wing; and although that officer has since been posted missing, the story has been left unaltered as a tribute to his gallantry.

"Flight" photographs by L. W. McLaren

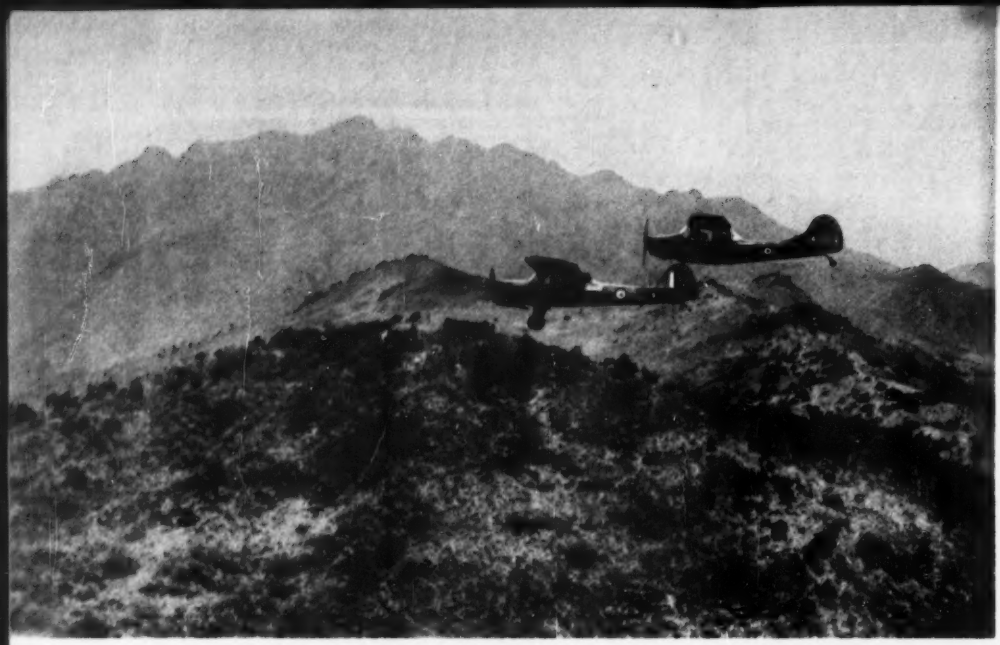
MY morning up-front was a full and memorable one, for before lunch I had visited, and flown with, No. 1913 Light Liaison Flight and No. 1903 Independent Air O.P. Flight, Royal Air Force. These are the only R.A.F. units serving in Korea, and though little is heard of them at home (more's the pity), "The Flights" have earned a splendid reputation throughout the Far East for their services to the Commonwealth Division and to the American Army, in difficult and dangerous circumstances.

No. 1913 was formed at the Light Aircraft School, R.A.F. Middle Wallop, in June, 1951, under the command of Capt. P. A. Downward, of the Glider Pilot Regiment; and by a stroke of luck I reached it in Korea the day before Capt. Downward handed over.

Though a Royal Air Force unit, the Flight (in common with other Auster units operating with the Army) is supplied with pilots, and with various other personnel, by the Army; so at Middle Wallop the ancillary Army tradesmen were initiated into airscrew swinging, picketing and marshalling of the Austers. Thence the Flight was transferred to North Wales for training under "Korean conditions" (Wild Wales indeed!), and in late August embarked for Japan.

The Austers were assembled at Iwakuni and delivered to Korea where the men dug in, pitched their tents and erected a staff for the R.A.F. ensign. The winter was extremely cold and maintenance a sore trial. Prop-swinging was made hazardous by the ice, and at the close of each day covers had to be placed on the Austers and flameless heaters positioned under their Gipsy Major engines. Major-General Cassels, then G.O.C. No. 1 Commonwealth Division, and U.S. Generals Ridgway and Van Fleet were frequent visitors to the strip, and the Flight soon established a reputation for dependability and adaptability. Thus, when it was decided to employ the Austers on reconnaissance, rear observers were recruited from within the Flight itself.

Other than Capt. Downward (his regiment is the South Lancs., and he was awarded the D.F.C. during his Korean service), the "old sweats" are Capt. P. F. Wilson (now in command), and Staff Sergeants Hall and Rolley. Capt. Downward completed 201 sorties over the front line between November, 1951, and January, 1952, and has had his fair share of narrow operational squeaks. Capt. Wilson (The Buffs) has also had his ration of excitement over the lines, but, strangely enough, he was most nearly prevented from ever taking over the Flight by a "friendly" T-6 which, having been shot up, made for the Auster strip. The pilot's vision being obscured by oil, he bounced the T-6 heavily into a ditch, where it shed its undercarriage. Wheel-less, it then set about chasing Capt. Wilson, duly caught him and sent him somersaulting into a paddy-



An Auster of No. 1913 Flight with the Cessna L-19. (Right) Imsun Gun and Kim Yun Gi, South Korean youngsters serving with the Flight.

THE SHARP END . . .

field. Members of the Flight extricated him under the fire of R.P.s from the now-flaming aircraft, and, the tanks having failed to explode, the pilot and observer escaped uninjured. Capt. Wilson was less lucky, but seemed none the worse when we talked to him the other week.

Capt. H. Irwin, D.F.C. (Royal West Kents), is an ex-fighter pilot, R.A.F., and Staff Sergeants Hall and Rolley are both war-time glider pilots; "Staff" Hall did glider ops. on D-day, at Arnhem and on the Rhine, and Rolley, with nine years in the Glider Pilot Regiment behind him, had extensive Hamilcar experience. Sergeant J. Hutchings, D.F.M., is regarded as "the General's pilot," being responsible for flying Major-General A. R. West, G.O.C. No. 1 Commonwealth Division, in the Flight's cherished Cessna L-19. He formerly flew Austers in Malaya and has a reputation for consistently accurate reporting of enemy positions in face of anti-aircraft opposition.

Sergeant Jermy is credited with the "nearest miss" to date : his Auster was turned practically upside down by a 37 mm burst—without apparent damage.

No. 1913 Flight is mainly engaged in visual-reconnaissance and communication flying. Reconnaissance over the lines may be undertaken with or without a passenger; and if one is carried he may be a senior officer, a patrol commander familiarizing himself with the ground, or a mortar-platoon officer or sergeant supervising a shoot with a battalion's 3in mortars. Occasionally a low-level sortie in search of missing patrol members may be called for and this may entail penetration behind enemy positions.

The Army commanders use the Flight as an accurate and fast means of reconnaissance in forward and rear areas, and for the Engineers it can do an especially useful job. For instance, the Austers may fly down the divisional roads to ascertain where repairs or flood clearance is needed, or to seek good timber for dug-out props.

When the Flight first began operations in Korea sorties of 3-4 miles over enemy territory were fairly common; but with the accretion of light A.A. during the past six or eight months such flying has been limited to "essential occasions." Sightings have, in any case, steadily decreased, for not only have enemy day-time movements been reduced almost to vanishing point, but camouflage has improved and the enemy is reluctant to betray his positions in any way for fear of air strikes.

Though the Flight works primarily with infantry, it does not fail to put the artillery on to "opportunity" targets, e.g., concentrations of men or active supply points. To this end the pilots undergo a short artillery course so that, by changing their radio frequency to that of the gunners, they can "do a shoot" with them, using a simplified technique. Alternatively, they may call up the A.O.P. Flight and ask an Auster to look in on a given map reference.

Usually, when over the lines, the Austers fly above small-arms range, though often within range of 20 mm and 37 mm fire, a certain amount of which has been forthcoming, as we shall later confirm. A control vehicle informs the pilot of friendly artillery activity, but he must work out for himself those unhealthy areas where the trajectories of the shells will correspond with the Auster's flight path. Through his binoculars he may see groups of perhaps 40 or 50 of the enemy who, having moved up before first light, may be laying-up in a "concealed" area ready for an evening attack on our positions. He will note the usage of roads, supply points, any new diggings, field works, and active guns or mortars; and once the Flight was asked to keep tally on an expanding Chinese grave-yard. The score reached over a hundred.

Generally the pilot will fly with one ear uncovered so that he may hear the crack of passing bullets.

Capt. Downward told me how the terrain varies with the seasons. In the winter snows the tracks of vehicles can be easily picked up; in the spring the greenery and foliage give natural camouflage; and towards the end of summer, when the natural colour is turning to brown, the artificial camouflage can often be picked out.

Communication flying is now the Flight's heaviest commitment, and for such work in the rear areas V.H.F. is fitted to the Austers so that the pilots can work the American frequencies. One Auster 7 is engaged solely on communication flying, for which task it is superior to the Mk 6. Even so, a typically bulky senior officer in winter clothing may be subjected to some undignified situations. Much preferred for V.I.P. work in the Flight is a Cessna L-19, or Bird Dog, loaned by the 8th U.S. Army primarily for the G.O.C.'s use and usually flown by Sgt. Hutchings. I was assured that it lands in about the same distance as an Auster, takes off shorter, and has a very much steeper climb; which is hardly surprising, for it has a 220 h.p. Continental engine and is of much later design. Recent V.I.P. passengers logged by Sgt. Hutchings are Admiral McGrigor, Admiral Sir John Collins, Vice-Admiral Mainguay, Sir Esler Denning, Lt.-Gen. Bridgeford and Lt.-Gen. Miller.

Each month the Flight issues a confidential resumé of its

(Left) Officers of No. 1903 Independent Air O.P. Flight: (l. to r.) Capt. P. J. A. Tees, R.C.H.A., Capt. K. Perkins, R.A., Capt. R. S. Deacon, R.A.A., and Capt. G. W. C. Joyce, D.F.C., R.A. (Right) "Light liaison" over the wire by No. 1913 Flight.

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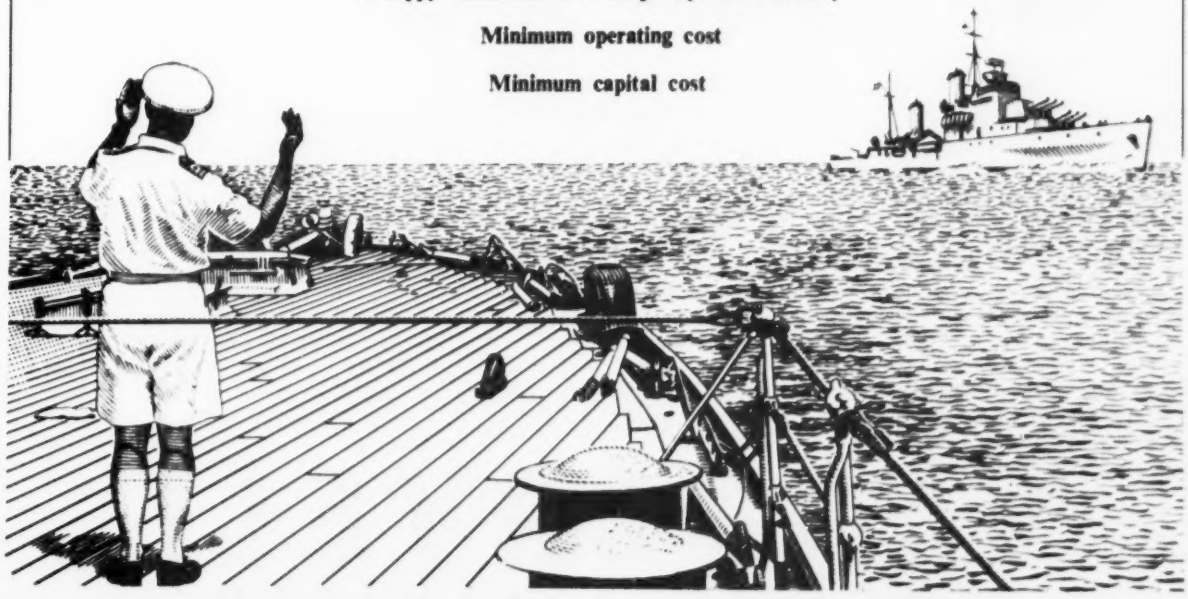

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Left, an Auster of No. 1913 Flight leaves an advanced Korean strip for a sortie over the forward areas. Above, the officers' mess of No. 1903 Flight—named "Casa Mitty" after a Canadian officer formerly serving with the Flight. Capt. Peter Tees is seen in transit.

THE SHARP END . . .

activities, from a few of which I am privileged to quote. Thus, of last winter—"The strip has now become fairly well hard-baked and normally dries off quickly with the high day temperatures. The first heavy rain of the season caused quite a startling change, which literally happened overnight. The whole of the countryside changed colour from the drab brown and grey to a very fresh green which was soon mixed with the blazes of colour of the various blossoms." (Nor did it pass unnoticed that, under the pretext of erecting camouflage, Sgt. Killelea arranged a flower garden around the command post.)

Of last December—"The month started with an extremely cold spell which affected everyone from V.I.P. to airman alike." The V.I.P. was the President-eiect, General Eisenhower, whose visit was kept so secret that the first the Flight knew of his presence was a host of light aircraft arriving on the strip during breakfast.

A bitter north-west wind at about that time hit the Flight severely. The biggest difficulty was getting the aircraft started and de-frosted, and the already urgent need for a hot-air blower became a top priority, resulting in delivery the same day. Internal accumulators and trolley accs. suffered severe punishment owing to sluggish starting. "Pilot comfort," one reads, "is almost non-existent, and the bulky clothing which is quite indispensable, together with parachute, only succeeds in cluttering up an already cramped cockpit and effecting a further reduction of one's blood circulation. Feet suffer more discomfort than any other part of the body."

Capt. Wilson told me of the comradeship existing between the Flight and L-17, L-19 and L-20 units of the U.S. Army, engaged in similar tasks. It was, in fact, a U.S. Army artillery pilot—Lt. Lane Westberg—who was flying McLaren when he secured his pictures of the Auster and Cessna over the mountains. I took the opportunity of riding in the Cessna with Sgt. Hutchings, and he demonstrated the short take-off, 1,000ft/min-plus initial climb, and general handiness. We flew round Gloster's Hill, and saw the positions so valiantly held in the historic action, before putting down at a strip from which No. 1903 Independent Air O.P. Flight was flying.

Having served in Malaya and Hong Kong, this R.A.F. unit was sent to Korea in October, 1951, and ever since has operated in support of the Commonwealth Division. The Commanding Officer, Major J. M. H. Hailes, D.S.O., R.A., being temporarily absent, I was greeted by Capt. G. W. C. Joyce, D.F.C., R.A. (believe it or not, an ex-Naval pilot). He told me that an Auster of the Flight was at that moment conducting a shoot of heavy American guns against enemy artillery and supply areas. The lighter 25-pounders of the Commonwealth Division, he explained, were generally used against troops and supply areas nearer the lines, and the speed with which they could be brought into action for close support or flak suppression was at once the pride of the gunners and the comfort of the troops and A.O.P. pilots.

The tasks of 1903 Flight, in conjunction with the artillery, were stated for me as counter bombardment (this is the primary role), engagement of troops and supplies, observation of enemy defence improvements, photography of enemy features, and cover for minor and major offensives.

The Auster A.O.P. 6s have armour plate and the pilots fly solo, with parachutes. On a counter-bombardment sortie the pilot observes and map-spots gun positions and engages any active guns with heavy American pieces. The enemy guns are usually in three or four pits, and hits by the American shells do extensive damage. Having returned from his sortie, the pilot marks an air photograph, which is forwarded to the counter-bombardment officer at H.Q. Royal Artillery. All briefing and shooting is done from air photographs. From time to time the targets thus "pre-ranged" are reconnoitred for improvements or activity. Should a pilot happen upon an opportune target, such as troops, in the course of one of these sorties, it is up to him to put the Commonwealth Division's 25-pounders on to them without delay.

Dusk sorties are flown in order to spot the flashes of enemy guns, and, if the light allows, the positions are forthwith engaged. A night landing is always incurred. A further responsibility which falls to the Flight in the event of a heavy attack by either side is the flying of dawn sorties to provide information and direct gunfire.

On a normal day the Austers fly about seven sorties, of which three may be operational, one a reconnaissance of the Division's front, and one an admin. flight. A typical operational summary would run: "Three counter-bombardment sorties successfully flown, two gun positions being destroyed and one damaged. Improvements noticed in diggings and bunker building. Eight separate groups of men and supplies effectively engaged." In a good month each pilot will put in 45-50 hr flying.

(Right) An Auster of No. 1903 Flight in its revetment. (Below) Dug-outs and tents are the fashion at the advanced strips used by the Auster Flights.

(Left) The frozen River Imjin seen from an Auster A.O.P.6 of No. 1903 Independent Air O.P. Flight. (Above) An Auster of the Flight in its wind shelter.

THE SHARP END . . .

Most sorties are flown above 5,000ft, out of consideration of light flak, which the Communists now have well forward in some strength. It is necessary, in any case, to fly high in order to keep clear of the path of our own shells. Precautions notwithstanding, the Austers are frequently rocked by the shells, and one pilot who under-estimated the American "Long Toms" found himself on his back.

Occasional calls are paid on the American artillery fire-controllers in order to discuss techniques and to smooth out any difficulties. On "clamp" days there is general admin. work to be done, and the pilots brush up their gunnery and signals procedure. Each, into the bargain, has some regular duty outside his flying, i.e. Flight intelligence officer, Flight quartermaster, transport officer, signals officer, photographic officer.

The C.O. has an especially exacting task, for he must know R.A.F., as well as Army, administration—besides flying 40 hours or so a month. As might be supposed, the mixed nature of the unit entails much duplication, though two clerks (one from each Service) manage to keep the paper-work at bay.

An average serviceability of 80 per cent is a measure of the job being done by the ground crews—half of whom are Army and half R.A.F.—in snow, mud, cold, dust, or come what may. Each Auster has a distinctively painted spinner; whenever an A.O.P. lands from a sortie (generally of 2¼ hr duration, but often as long as 3 hr) it is marshalled straight into its pen and made ready for the next operation. Well cared for as they are, however, the aircraft take a continuous beating, especially in winter. At one period engine and airframe icing was responsible for eight forced landings in ten days. Happily, all but one were on the strip.

After concentrated discussion of the foregoing matters—for our visit could only be brief—the Flight obliged by providing us with some first-hand impressions of front-line flying.

There were three Austers—my own, flown by Capt. R. S. Deacon, R.A.A.; McLaren's (Capt. K. Perkins, R.A.); and a third, which was making an actual operational sortie, and from which Capt. Joyce had promised to keep an eye on us.

As soon as we were airborne we could see that the roads and camps were lively with vehicles and men; but the liveliness ceased abruptly behind our own front line and nothing moved on the scarred and frozen ground beyond.

Capt. Deacon had loaned me his binoculars, promising that should I spot any men in the enemy positions, he would show me how quickly the artillery could be put on to them. So while the Auster climbed, I peered through the side panels, practising myself in the use of the glasses.

There was no intercom., so I could not ask what was what; and, in any case, it was difficult to centre selected features in the glasses. After some casting about I picked up a trench system and, having comforted myself with the thought that the Chinese were sound asleep following a heavy night, I straightened up and glanced ahead. Evidently I was not altogether right about the weary Chinamen, for suddenly blotching the morning sky, no great distance away, came five black bursts of flak. Supposing my own machine to be the intended recipient, I assessed the marksmanship as mouldy to putrid; then I noticed Capt. Joyce's Auster—closer to the bursts than our own—removing itself in the approved Porteous manner.

It has always seemed to me that the flakking of Austers ranks with the stalking of butterflies with a 12-bore—but that sort of thing is now being done. Happily, the body of opinion favouring the protection of Austers is strongly represented among the Gunners, and to watch them respond to an urgent complaint (accompanied by appropriate map reference) was a satisfying experience.

As I saw it, flak suppression entails the rapid and liberal application of red-flashing 25-pounder shells to the affected area. To be factual, the Division had eight guns saturating the designated spot in one minute. Even so, the position was reckoned to have been only neutralized—not destroyed; and it was thought probable that the heavies would be put on to it next day.

For half an hour we were now able to buzz unmolested over, and a mile or so beyond, the enemy lines. But peer as I might into the

(Right) An Auster A.O.P.6 of No. 1913 Light Liaison Flight over the forward areas. (Below) Major J. M. H. Hailes, D.S.O., R.A., Officer Commanding No. 1903 Independent Air O.P. Flight, Royal Air Force

maze of deep trenches interspersed with cleverly-positioned bunkers, I saw nothing to betray any movement or activity of any kind, either among the earthworks themselves or on the roads and tracks behind. What I did see was a deep, cunningly prepared defensive system hewn in the rugged earth and rocky hills, spattered with shell and bomb craters, but threatening to exact a heavy toll of assailing forces. I saw, too, the vaulting eruptions of 1,000-lb bombs delivered on the left by U.S. Marine Corsairs, and the curtains of dirt and smoke that hung in the air for minutes afterwards.

But I am still not sure which was the most welcome sight that morning—that of L. A/C.s Goodfield and Bennet marshalling our Auster in; the glass of sherry which Major Hailes, who had by then returned, offered us in *Casa Mitty*, the mess; or a cigarette, tendered from a silver box inscribed: "1903. From the Divisional Artillery. Korea 1951-53."

The major took his leave to make the Flight's third counter-bombardment sortie of the day, and I myself boarded the L-19 which had arrived to take me down to Seoul. To have visited those two great little Auster Flights, lodged up by the 38th parallel, was a privilege which I value above all others accorded me in my 32,000-mile journey.

I had now accomplished most of what I had set out to do in Korea, except that I had been disappointed when I called on the U.S.A.F. 4th Fighter Intercepter Wing in the hope of finding S/L. Graham Hulse, D.F.C., R.A.F., at home. So I called again and was lucky enough to spot him just emerging from his Sabre. Having had few British visitors, he gave me a large hullo (the Americanism is apt, for he was with the U.S.A.F. for two years before going to Korea) and, as his American colleagues pitched horse-shoes nearby, we smoked English cigarettes and talked of Russian fighters.

At that time there stood to his credit 1½ Migs destroyed (October and November, 1952) and one damaged (January, 1953). The digital Mig was unfortunate enough to be spotted, in company with a second, by the squadron leader when he was flying a photo. recce. escort at 30,000ft. "They were just across the Yalu at 5,000ft" he recalled, "so I dived after them and shot one down." I suggested to him that *Flight* readers might care to have some more circumstantial particulars, and he went on to recollect how the Mig-man had tried to outclimb him. The Sabre's impetus after the dive was too great for him, however, and Hulse was able to put three bursts into his wings and fuselage. The canopy flew off and the pilot ejected at 8,000ft. The Mig went its own sweet way into a sand-bank just off the coast and produced a satisfactory amount of black smoke.

The fractional Mig was finished off by S/L. Hulse after it had been shot up by the leader of a Sabre flight; it crashed and burned just south of Antung. The damaged one he set upon at 40,000ft. "I nipped in behind him at .96," he said, "and hit him three times before he got out of range."

When I met him, S/L. Hulse had flown 88 of his 100 missions; but I was not in the least surprised to read, on returning to England, this American bulletin: "S/L. Graham S. Hulse, of Staffordshire, England, a Royal Air Force exchange pilot flying F-86 Sabrejets with the U.S.A.F. 4th Fighter Intercepter Wing in Korea, shared credit for the destruction of a Mig-15, Friday, March 13th. It was the fourth time he has scored against the Russian-built jet fighters."

It occurred to me that a man who can spot a Mig 25,000ft below him must have a sharp eye, and I asked S/L. Hulse to describe the appearance of the Migs he had encountered. They were variously camouflaged, he said, often in light and dark green, but also in two shades of copper and in blue. Their red stars were encompassed by a red circle, and all under-surfaces were blue.

My only regret was that I could not visit other R.A.F. pilots serving with Sabre and Thunderjet wings; but before I boarded a 30 Transport Unit Dakota for Iwakuni, I was several times assured that they were very highly regarded by the U.S.A.F. and that their attachments were proving of incalculable value to both Services.

As an instance of inter-Services relations I conclude with the landing back at Iwakuni. The weather was fair, but F/O. Sherwood, the Australian pilot, was good enough to lay on a practice G.C.A. for my benefit, assuring me that the American controllers were really top-notch. As it happened, someone or something was a little off-colour that day, and at a critical stage in the proceedings we found ourselves confronted by a mountainside. The controller having been apprised of this fact, he was obliging enough to turn us right. Whereupon F/O. Sherwood proceeded to inform him in loud and clear Australian that, having been directed nearly into the mountains, we were now getting all the turbulence; in consequence of which he was calling the whole thing off.

When we landed the G.C.A. called up to apologise and explain; but the flying officer—disappointed that I had not experienced the usual excellent American service—reiterated his sentiments with undiminished force. To which there came the quiet and, it seemed to me, wholly conclusive, reply—"Thank you for your comments"!

And so it is in this grinding Korean war that the United Nations are learning from—and thus have increasing respect for—each other. The air efforts of Australia and Britain are small in scale compared with America's; but their impact is telling.

An Auster A.O.P.6 of No. 1903 Independent Air O.P. Flight, R.A.F., over the lines. Like the photograph on page 23, this was secured by "Flight" photographer L. W. McLaren from an Auster piloted by Capt. K. Perkins.

This three-quarter rear view of the Auster Ambulance/Freighter (previously G-AMKL) shows the larger fin and rudder area. The rear door is removed as for supply dropping.

AMBULANCE/FREIGHTER: *Improved Handling Qualities*

RECENTLY *Flight* had an opportunity to handle the Auster Ambulance/Freighter in its latest form—with fixed-pitch metal airscrew, 3-deg offset engine-thrust line, and other detail improvements which have followed development and a successful session at Boscombe Down. An assessment of its qualities at an earlier stage appeared in *Flight* of April 4th, 1952.

An improvement to be noted immediately is the control on the ground. Not only can the machine now be manœuvred adequately with the rudder and engine alone (i.e., without brakes), but in a trial of a "worst take-off case" with direction across and slightly down-wind, the rudder was powerful enough in its effect to turn the machine through 90 degrees against the wind within the first fifty yards of the take-off run.

Other impressions during a brief solo flight were of the improved harmony of controls and the effectiveness of the rudder, particularly down at low speeds. The extreme docility of the aircraft down to the lowest speeds was appreciated—and the speed can be very low with this aircraft.

Operation of the flaps up or down and quick changes of power have little effect on trim, and in any case the trim control is by means of a very accessible quick-action up-and-down lever mounted on the right of the pilot's instrument panel. The aircraft will overshoot readily from less than 50 kt I.A.S., and with full flap, and the stick load is light, even though the trimmer be left in the landing position. The climb away with flap down is very steep, as it should be with this sort of small-field aircraft.

The Cirrus Bombardier engine is responsive at all throttle openings and remains agreeably smooth when idling. It is started by cartridge.

We have from the start felt that this most practical and versatile little aircraft had great possibilities, and we have anxiously awaited an indication of official Service interest in this country. It is our understanding that Army pilots are very well disposed towards the Ambulance/Freighter. That there are excellent export opportunities we know, but these must depend upon production. Recent good news is that the Auster company have practically decided to put the machine into small-scale production without waiting to receive a M.o.S. order. M. A. S.

THE INDUSTRY

Blackburn Design Office in London

FROM Blackburn and General Aircraft Ltd., comes the announcement of the opening of a London design office at 63 Old Brompton Road, South Kensington, S.W.7. The office will be initially engaged upon work in connection with the Beverley Transport for the Royal Air Force but it is the intention that it shall develop on the lines of a self-contained unit, capable of handling major design tasks. It will be in the charge of an assistant chief designer responsible to the Chief Designer, Mr. B. P. Laight, at Brough, and the new post is being filled by the appointment of Mr. W. W. Greenfield, F.R.Ae.S., M.I.Mech.E.

Mr. Greenfield began his aviation career in 1924 as an apprentice to the Blackburn Company at Brough. Later he was with F. Hill and Sons of Manchester (makers of the Hillson Praga light aircraft) and towards the end of 1937 he joined the Fairey Aviation Company. In 1949 he became experimental engineer responsible for the design and development of helicopters. He then went to Boulton Paul Aircraft, in June 1950, as experimental manager.

IN BRIEF

DOUGLAS protractors, reported to be difficult to obtain by club pilots of certain overseas countries, are now available in this country either directly from the makers, the London Name Plate Manufacturing Co., Ltd., 35, Victoria Street, London, S.W.1, or through the Royal Aero Club Aviation Centre, at Londonderry House, 19, Park Lane, London, W.1. The 5in x 5in model is priced at 5s 6d, and the 10in x 10in at 15s 6d.

* * *

From Advance Components, Ltd., Back Road, Shernhall Street, London E.17, come details of constant-voltage transformers to operate from a 400 c.p.s. A.C. supply, with special attention having been paid in the design to considerations of weight and size. Typical figures quoted for a transformer of this kind are: Input—100-200 volts at 400 c.p.s. Output—2 volts; r.m.s. plus or minus 1 per cent; 10 amp. Weight and dimensions (including condenser)—12½ oz; 2½in high x 3in long x 2in wide.

* * *

Very complete information on the Redux bonding process for aircraft primary structures—written from a practical rather than a theoretical angle—is contained in a 98-page book lately published by Ciba, Ltd., the New York company associated with Aero Research Ltd., of Duxford, Cambridge. Numerous illustrations and a comprehensive bibliography are included in the work, copies of which are obtainable at 10s from the Duxford firm.

* * *

For the benefit of designers, draughtsmen, etc., concerned with the incorporation of Teleflex controls in industrial plant, a comprehensive parts list and installation manual has been produced by Teleflex Products, Ltd., Chadwell Heath, Essex.

* * *

Mr. G. W. Robinson, of 47, Ullswater Avenue, Acklam, Middlesbrough, has been appointed to represent Jenolite, Ltd., manufacturers of industrial chemical specialities, in the North East.

* * *

To managements, industrial research workers and others who are interested in the composition, behaviour and control of atmospheric dust we can recommend the *Metwul Handbook* (3rd edition), a very thorough study of the subject by Dr. Ing. E. Zurek, M.I.Mech.E., managing director of John Yuille (Metal Works), Ltd., makers of "Metwul" air filters. The book—which, incidentally, contains some useful miscellaneous data and conversion tables—is obtainable at 5s. from the company's offices at Hillington Industrial Estate, Glasgow, S.W.2.

PROGRESS

Already the Avon engine has progressed from the basic RA.2, with its initial thrust of 6,000 lb., through the RA.3 to the 7,500 lb. thrust RA.7 with full anti-icing and the RA.7R, re-heat, of 9,500 lb. thrust.

Avon engines have already flown over 40,000 hours.

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B R I T I S H E U R O P E A N A I R W A Y S

CORRESPONDENCE

The Editor of "Flight" does not hold himself responsible for the views expressed by correspondents in these columns; the names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

Where Helicopters Stop

I SEE that the subject of a suitable name for helicopter landing sites has cropped up again. If your correspondent Mr. Jenks (June 12th) had carried his reasoning a fraction farther, he would have arrived at the supremely suitable term "helicopter station." Of course, I realize that the six syllables take at least a second to pronounce, while, in writing them, efficiency is lowered by the necessity of removing the pen from the paper halfway through—facts which the railway authorities were apparently foolish enough to overlook.

It would also be a little hard on the enthusiasts who thought so long to mint such words as "heliport" and "up-down" (the latter was actually suggested), but they would have the consolation of knowing that their own little brainstorms would be extremely acceptable to the daily Press, whose monosyllabic headlines are at once the breeding-grounds and chief employers of such terminology—though a bright sub-editor might easily discover "H-stop" and beat everyone.

Chislehurst, Kent. M. C. HALL.

Clostermann and Armament

THE review of Pierre Clostermann's *Flame in the Sky*, containing his fascinating account of the first encounter of Allied bomber formations with the latest air-combat weapons of the Luftwaffe, also poses the question: ". . . one can only wonder why the R.A.F. has not armed its fighters for the last seven years with R4Ms and Ez 42 sights."

Having previously drawn attention in *Flight* to progress in fighter armament by the Luftwaffe technicians (in particular in the issue of January 25th, 1951), the following additional information might be welcome.

Contrary to Clostermann's story, Oberst Gordon Gollob was not killed by the two Tempests. Gollob is still much alive. After the war he published a memorandum which gave facts concerning the superiority of the latest German fighter armament. There is reason to doubt if the planners in the M.o.S. have ever heard of it.

The Ez 42 gun-sight was not due to a "Professor" Fuchs; it was developed by the Ascania Works, and their engineer Wernicke made the most important contributions to it. A Herr Fuchs was concerned with the evaluation of captured Allied sights.

Fraulein Dr. Schwarz—one of the most able German ballisticians—was intimately concerned in the development of mine-shells (i.e., blast-acting) generally, but had nothing to do with the R4M development. She served with the Research Institute of the German Arms and Ammunition Works (DWM) at Luebeck-Schutup.

The R4M supersonic rocket missile was an official development instigated by the Engineer-in-Chief of the Luftwaffe air-borne firearms development, Dipl.-Ing. Johannes Mix (to whom I owe the personal information given here). Herr Mix had been in this position since about 1926. The preliminary design was due to Dr. Schilling, then in charge of rocket development within the ammunition department of Herr Mix's set-up. Previously, systematic destruction trials had proved the necessity of 500 grammes of H.E. in order to produce the certain destruction of a large bomber by a single hit at any place. The first R4Ms (ballistically still deficient) were assembled from parts supplied by various firms. The mass production of a greatly improved version was in preparation but had not progressed to results when Germany collapsed.

In connection with R4M and Ez 42, the corresponding German airborne automatic gun development throws an interesting sidelight on the M.o.S. mismanagement of the available technical progress.

Without doubt, the German Mauser MG 213 gun of 30 mm calibre was—and most probably still is—the most advanced airborne cannon in the world. Even if the small supersonic rocket missile should entirely supersede the cannon as fighter weapon (see my paper on the subject), a gun like this would retain value as a long-range defence weapon for large aircraft.

The designer of MG 213, Director Linder of the Mauser firm, and Dipl.-Ing. Mix, Luftwaffe instigator of this development, were actually employed by M.o.S. immediately after the war, in the Underluess Work Centre, in order to disclose all information. Linder, moreover, spent six weeks in London to enlighten experts and also handed over the only two remaining weapons of this type (all other specimens having been destroyed by Herr Mix to prevent them falling into Russian hands). Linder learned that there was "no interest" in his gun. He and Mix were dismissed from the Work Centre and left to rot (or, if they felt inclined, to join the Russians). The gun-designing teams of Mauser and Rheinmetall-Borsig (who had previously been promised employment in this country) were also dismissed, and one of the best opportunities was lost to secure the German armament progress for the defence of this country.

Today, thanks to this sort of planning, the present position and the future before us are as follows:

(1) Nearly all R.A.F. fighters are still equipped with the 20 mm Hispano gun (which is no match for the standard Russian armament).

(2) The MG 213/30 gun is being produced by the Swiss Oerlikon firm (under the direction of Herr Linder), and as there is no British equivalent, it will in future probably be necessary to import this gun or to acquire a licence.

(3) Electronic gun-sights and fire-control devices will be of American design and manufacture.

(4) The air-combat rocket missile, which the R.A.F. needs, will most probably be an adaptation of the American "Mighty Mouse" 3in rocket. But this is basically nothing but an enlarged version of the (2in) R4M—of the original, ballistically still-deficient, design. The alternative would be to acquire the Oerlikon-constructed, improved R4M.

Dunstable, Beds. A. R. WEYL, A.F.R.Ae.S.

Unification for Simplification

THE distance from pole to equator is not 10,000 km. The base of the metric system is the metre, originally defined as 1/40,000,000th of the circumference of the earth; but, as with the knot, someone got the sum wrong, and the kilometre is one thousand times the distance, at 0 deg C, between two marks on a platinum-iridium bar kept at Sèvres. As the earth is an oblate spheroid, the definition in 1799 held only for a Great Circle drawn through Paris and the poles; and, of course, the earth has wobbled a bit since then.

May I echo, as direct (not, as he intended, rhetorically), Mr. L. F. E. Coombs' final question (*Flight*, May 15th, page 612)? "Why not," he asked, "give the *Queen Mary's* speed in m.p.h.?" The "man in the street," whatever arbitrary systems the professionals may agree (or disagree) to use, thinks, as did everyone before the French Revolution, in terms of those things he meets in everyday life—horse-powers, and miles per hour.

The majority of the population have, happily, never heard of relative velocity, and those who know 13 kt is roughly 15 m.p.h. seldom relish the calculation; most people know that the Americans use the 2,000-pound ton instead of our 2,240-pound ton because they like everything they make to look bigger than any other; quite a lot of people know you can roughly convert km to m.p.h. by a five and an eight; not all of them remember which to divide and which to multiply by, but at least there is no 32 to add or subtract. Our monetary system seems to present few problems to the dullest of us; there may be those who cannot read or write, but try giving them the wrong change!

The metric, despite gravity the simplest system, is taught in many schools; if adopted it would give universal units for land, sea, and air, a great advantage.

Do not, while the nautical and aeronautical journals use knots, encourage the lay Press to do the same; we must try to foster the interest of the ordinary man, and you do not do that by giving him statistics that he does not understand. That a ship averages 30 kt means little to him; tell him it goes 720 miles in 24 hours and he may be interested. Few people worry whether these are land or sea miles. They feel at home with the mile, they know (except when you stop, in some strange area, to ask for directions) what it is. Thus the experts may laugh at those who work out, and publish, how many times the fuel-load of a bomber would run a 10 h.p. car round the world; but it means something to the chap who has a 10 h.p. car, and, despite the fact that relationship between thrust and horse-power is not easily calculable, an approximate figure gives him some idea how many times an engine exceeds the power of his car—much better than leaving him (as has happened) to divide by 550, and be very puzzled by the result.

Anything which standardizes screw threads must surely be welcomed by all; there can be few who have not needed a nut and bolt, and found them, only to discover one is a B.A., the other a B.S.F., while as for the manufacturers who use their own special threads . . . !

Cambridge. PEDANTICA.

CLUB AND GLIDING NEWS

OUR GEMINI: Seen here with other visiting aircraft at the National Air Races at Southend, "Flight's" Gemini now sports a new paint scheme. Appreciation of her appearance was recently shown at the Southern Aero Club's "At Home," when G-AFLT won the Concours d'Elegance.

SHOREHAM was under the (rainy) weather for part of the Southern Aero Club's "At Home" on June 21st, in spite of which an informally pleasant time was enjoyed by the occupants of the score of visiting aircraft, of nine different types. Among the machines were the Proctors of McIntosh and "Buster" Paine (racing numbers 72 and 73 bearing witness to their previous day's activity at Southend), while in the afternoon a late visitor was Ron Paine in his Speed Six.

Winner of the arrival competition was Mr. Lewis, of Portsmouth, in a Tiger Moth, while Mr. J. Miller, a "local boy" of the host club, made good in the spot-landing contest, managing both to find the spot and to land near it. A *Concours d'Elegance* prize, awarded to the smartest visiting aircraft, was won, we record with modest pride by our own Gemini, G-AFLT. Prizes were presented to Mr. Lewis, Mr. Miller and *Flight* representative Ken Owen by Capt. O. P. Jones, of B.O.A.C.

Balloon-bursting and flour-bombing by veteran C.F.I. Mr. C. L. Pashley, Mr. E. Westbrook, Mr. Graham Head and Mr. Brunicardi were the late-afternoon attractions, accomplished (in spite of independent-minded balloons, a highly manoeuvrable turf-board target and the rain) in an Auster and a Hawk Trainer of the Southern Club. During the intervals, the band of the Worthing branch of the Women's Junior Air Corps added a fiercely energetic musical contribution to the programme.

ACCORDING to reports from France, the parachuting competition due to be held there from July 27th-August 1st will be a national event instead of a world championship, as originally planned. As the winners of the previous world parachuting contest, staged by Jugoslavia two years ago, the French were responsible for organizing the 1953 contest.

An article in the Paris Press said recently that a modified set of rules suggested by the F.A.I. parachuting representatives of four other countries—the United Kingdom, Jugoslavia, Holland and Austria—was regarded as "too easy" by the French. Accordingly, French parachutists decided to hold a national competition, retaining their own set of rules.

The main objection to the French programme apparently centred on the proposed duration of the free-fall part of delayed drops. Protracted delays are frowned upon by most authorities, but parachutists at the French contest will allow up to 20-30 sec to elapse before pulling their ripcords.

ENTRIES for the National Gliding Championships at Great Hucklow, Derbyshire, from July 25th-August 3rd, total 37, it is announced by the B.G.A. From the list of entries (reproduced in the adjacent table) it is seen that the Slingsby Skylark (described in *Flight* of June 19th) entered in the Individual Class by Mr. F. N. Slingsby is the only new machine to take part. The most popular entrant type is the Olympia, as in previous championships: this year the total is 17. Philip Wills will fly his world-beating Sky, so successful in Spain last year, and the London Gliding Club's *Elizabeth* will be flown in the championships by Geoffrey Stephenson. This actual machine, now rebuilt, was originally the one in which Frank Foster force-landed during the first stages of last year's international contests: Foster is flying an Olympia in this year's nationals. The only other Sky to be entered comes from the Empire Test Pilots' School at Farnborough.

Among the annual awards at the national contests are the Kemsley Cup, to the best-performance club in the team championship; the Londonderry Cup, to the winner of the individual championship; the L. du Garde Peach Trophy, to the winner of the team championship; the Firth Vickers Trophy, for the best performance by a British pilot in a British glider; the Eon Cup, for the best performance by one of the numerically most popular types of British glider; the Furlong Trophy, for the best two-seat performance; and the Slingsby Trophy, for the best flight in a T.21B Sedbergh.

STATE OF THE PARTIES: Positions currently occupied by pilots competing in the British Air Racing Championship are shown below. Final placings now depend on the results of the Siddeley Challenge Trophy event.

BRITISH AIR RACING CHAMPIONSHIP

Competitor	Nat. Air Races points	Total points	Competitor	Nat. Air Races points	Total points
J. Rush	26	53	F. Murphy	9	9
W. P. Bowles ...	32	47	M. R. T. Chandler...	7	7
R. R. Paine ...	20	47	C. M. M. Grece ...	5	7
W. P. I. Fillingham	32	41	D. M. Spencer-Smith	7	7
G. R. I. Parker ..	6	39	R. H. McIntosh ...	7	7
A. S. K. Paine ...	20	31	H. J. G. Turner ...	3	7
D. J. Bennett ...	16	30	Miss E. L. Curtis ...	—	6
D. R. Robertson ...	30	30	J. R. Batt	6	6
F. Dunkerley ...	20	28	E. W. Westbrook ...	5	5
J. N. Somers ...	4	22	G. F. Bullen ...	5	5
P. Hillwood ...	—	21	Miss F. M. Leaf ...	3	3
C. Gregory ...	19	19	A. Bough	—	2
Prince Alexander ...	19	19	C. H. Davies ...	—	2
S. A. Holloway ...	—	17	K. M. Freeman ...	2	2
A. J. Spiller... ...	4	17	D. Fitzgerald ...	—	2
D. C. Jemmett ...	9	16	A. Jones	—	2
N. F. Duke	13	13	C. W. W. Turner ...	2	2
D. F. Ogilvy ...	13	13	H. C. Wilson ...	—	2
G. C. Marler ...	6	10			

1953 NATIONAL GLIDING CHAMPIONSHIPS

No.	Type	Entrant	Pilots
Individual Class			
1	Sky	P. A. Wills	Entrant
2	Sky	London G.C.	G. H. Stephenson
3	Olympia	Frank Foster	Entrant
4	Mu 13a	Royal Naval G.S.A.	Lt.-Cdr. G. A. J. Goodhart
5	Skylark	F. N. Slingsby	Lt.-Col. A. J. Deane-Drummond
6	Olympia	D. A. Smith	Entrant
7	Olympia	Surrey G.C.	C. W. Dowdall
8	Weihe	Surrey G.C.	W. A. H. Kahn
9	Kite II	Andrew Coulson	Entrant
10	Sedbergh	R.A.F. G.S.A., Middleton St. George	Cpl. L. Simpson
Team Class			
11	Olympia	Army G.C.	D. L. Martlew, J. S. Williamson, P. Wenham
12	Olympia	Bristol G.C.	J. D. Jones, M. J. Hodgson, G. E. Miller, J. M. Hahn
13	Olympia	Cambridge Univ. G.C.	G. R. Whitfield, J. Grantham, A. R. I. Austin
14	Prefect	Cambridge Univ. G.C.	A. B. Adams, J. P. W. Gaskell
15	Olympia	Imperial College G.C.	W. N. Tonkyn, A. G. Oram
16	Olympia	London G.C.	C. A. P. Ellis, G. H. Lee
17	Olympia	Southdown G.C.	W. F. Jordan, J. F. Godley, D. C. Snodgrass
18	Gull IV	R.A.F. G.S.A., Cosford	S/L. R. H. Pelling, F/L. T. Page
19	Weihe	2nd T.A.F. G.C. Assocn.	Cpl. McKercher, Cpl. Brennan
20	Sky	E.T.P.S., Farnborough	P. L. Bisgood, A.D. Dick
21	Olympia	E.T.P.S., Farnborough	F. C. Rigg, C. H. Macfie, J. D. Price
22	Olympia	Major C. G. Dorman	Major C. G. Dorman, S. Morison
23	Olympia	R. G. Frecheville	R. D. Dickson, R. G. Frecheville, W. A. S. Murray
24	Olympia	Hickling and Cotton	J. H. Hickling, J. L. Cotton
25	Kite IIA	F. G. Irving	F. G. Irving, L. J. W. Hall
26	Olympia	M. V. Laurie	J. C. Neilan, M. V. Laurie
27	Olympia	Prof. G. C. Varley	Prof. G. C. Varley, R. C. Stafford-Allen, R. M. H. Goodhall
28	Olympia	A. H. Warminger	A. H. Warminger, B. Gould
29	Olympia	A. H. Yates	A. H. Yates, G. Nixon
30	Petrel	Yorkshire Soaring Syndicate	R. C. Pick, S. C. O'Grady, A. de Redder
31	Sedbergh	A.T.C. Gliding Instructors' School	F/L. A. D. Piggott, F/O. E. J. Meddings
32	Sedbergh	A.T.C. No. 168 G.S., Detling	K. W. O'Riley, H. G. How
33	Sedbergh	A.T.C. No. 106 G.S., Henlow	S. R. Dodd, F. E. Allen
34	Sedbergh	A.T.C. No. 89 G.S., Christchurch	S/L. F. R. E. Hayter, P/O. J. C. Allan
35	Sedbergh	A.T.C. No. 49 G.S., Newton	W. D. Campion, B. Longstaff
36	Sedbergh	Cambridge Univ. G.C.	A. L. L. Alexander, G. S. Neumann
37	Sedbergh	Imperial College G.C.	R. A. B. Macfie, P. Murden

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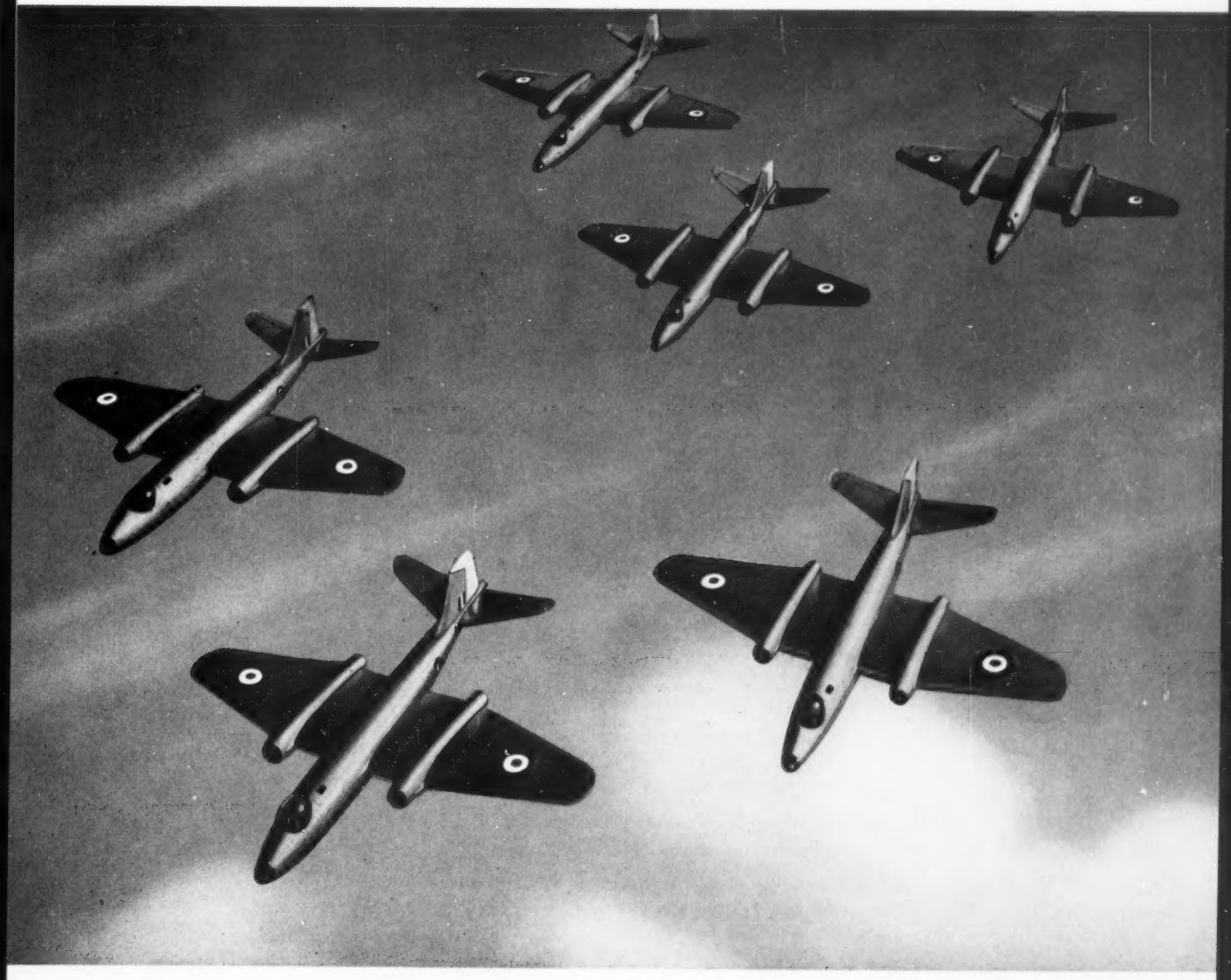

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QUEENS HOUSE, KINGSWAY, LONDON, ENGLAND

FOKKER F.27 *Friendship*

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REQUIREMENTS

The F.27 "Friendship", a high-wing twin-turboprop airliner, fully meeting I.C.A.O.- safety requirements, fulfils a long-felt need for airline operators with short to medium range traffic.

For normal traffic the "Friendship" has a 28-seat cabin arrangement, with backward facing seats, considerably increasing passenger safety.

For high-density or mixed cargo/passenger traffic the number of seats can be increased (32-40) or decreased (enlarging the cargo compartment).

ROYAL NETHERLANDS AIRCRAFT FACTORY

Fokker

CIVIL AVIATION

ROYAL COMET FLIGHT

THE B.O.A.C. Comet 1 carrying H.M. Queen Elizabeth the Queen Mother and H.R.H. Princess Margaret to Salisbury, Southern Rhodesia, where the Queen Mother will open the Rhodes Centenary Exhibition, was due to leave London Airport on Tuesday at 2.15 p.m. The Royal party were due to arrive at Kentucky Airport at noon the following day, having slept in the aircraft. Names of the crews were given by B.O.A.C. as (London-Khartoum) Capt. A. P. W. Cane, 1st/Off. D. Whitham, Eng/Off. W. L. Bennett, R/Off. D. H. Kelly, Steward R. H. Bennett and Stewardess E. M. Bartholomew; and (Khartoum-Salisbury) Capt. E. E. Rodley, 1st/Off. R. Langtry, Eng/Off. J. Kingston, R/Off. R. J. Dolman, Steward C. R. Smith and Stewardess P. Hollister. Steward E. Charlwood was to have accompanied the party throughout the journey.

AUSTRALIAN VISCOUNTS

SOME of the preparations being made by Trans-Australia Airlines for the introduction on domestic routes of their six Viscounts, delivery of which will begin next year, have been outlined by the company's director of operations, Mr. John Chapman. One of the first steps, he said, was to train a group of DC-3 captains to replace a number of DC-4 and Convair pilots, who, in turn, must be trained in Viscount operation. The first Viscount pilots will come to Britain towards the end of this year and those chosen to ferry the new aircraft to Australia will arrive here about two months before the company takes delivery. Some of T.A.A.'s senior engineers are already studying Viscount maintenance and operation in this country, and on their return to Australia they will organize technical courses for both engineering and flying personnel. The T.A.A. flying staff, incidentally, now numbers 266—captains, first officers, junior officers and radio officers.

BRITISH BREGUET

AS announced in the previous week's issue, Silver City Airways have hired from the French Breguet company the second of three pre-series Breguet 761 Deux Ponts, powered by four 2,020 h.p. Pratt and Whitney R-2800s. This is the aircraft which, as related in *Flight* of April 10th, has flown 700 hours as a freighter with Air Algérie. It was flown away from Toulouse last week by Captain C. I. Hopkins for a period of service on the Berlin-Hamburg airlift, where Silver City are operating under contract to the German Senate.

The company's intention is to evaluate the big Breguet for possible application to the cross-channel vehicle ferry services. The Deux Ponts will be capable of carrying six cars (three on each of its two decks) and, if its economic and handling qualities prove suitable, Silver City say they will put several into service next year. As the French aircraft are available for relatively early delivery, the ferry company's proposed order for Blackburn Universal Freighters would presumably be dropped.

At present, however, none of the company's terminals (Lympne, Gatwick and Southampton) has a runway capable of handling a Deux Ponts: hence the decision to carry out trials in Germany. Silver City expresses the hope that "at least one British runway will be ready soon," which confirms suggestions that the company intends to build its own terminal in south-east Kent.

ROYAL CREW: The honour of flying H.M. Queen Elizabeth the Queen Mother and H.R.H. Princess Margaret between London and Salisbury, Southern Rhodesia, has fallen to B.O.A.C. Two crews were selected to staff the Royal Comet, which was due to arrive at Kentucky Airport on Wednesday. Those shown are (left to right) Capts. Rodley and Cane and Stewardesses Hollister and Bartholomew.

PRECURSORS of B.E.A.'s projected large helicopters are two Bristol 171s, first British rotorplanes bought by the Corporation, which will shortly be used on passenger-carrying internal services. The first aircraft is seen in the hands of Capt. "Jock" Cameron shortly before he took delivery at Filton last week.

JAN SMUTS AIRPORT OPENING

AN official announcement from Johannesburg gives September 9th as the opening date for the city's massive new Jan Smuts Airport. All the services now using Palmietfontein will be transferred to Jan Smuts Airport on that date. At present, B.O.A.C. Comets are the only aircraft using the new terminal.

A NEW DOUGLAS

AN extremely flexible interior layout is the chief feature of the latest addition to the DC-6 series of transport aircraft, announced recently by the Douglas Aircraft Co. Designated DC-6C, the new model can be converted "in a matter of minutes" from an airliner carrying 76 passengers and bagg·ge plus 2,400 lb of cargo to a freighter capable of lifting almost 13 tons. Its dimensions are identical with those of the DC-6B and DC-6A, and it retains the large fore and aft loading-doors of the latter type.

A movable bulkhead, which can be placed at any one of four stations in the DC-6C fuselage, enables the proportions of passengers and freight to be varied according to traffic conditions. Seats are of a special lightweight type which fold against the fuselage walls when the aircraft is being used solely for freighting. Like the DC-6A and B, the new Douglas is fitted with four Pratt and Whitney R-2800 CB engines giving a cruising speed of just over 300 m.p.h. Since there are virtually no design differences between the DC-6A and the DC-6C, the announcement seems to reflect a sales gambit rather than a major technical development.

B.C.P.A. RE-SHUFFLE

DETAILS of administrative re-organization, necessitated by expansion of the company's operations, are announced by British Commonwealth Pacific Airlines. The re-organization involves the regrouping of responsibilities into two major branches. They are commercial and finance, and operations. The former is controlled by the commercial and finance director (Mr. I. O. Lawson) and contains three divisions—traffic and sales, finance and publicity. The operational branch, under the director of

AIR FRANCE makes a bold showing at Le Bourget, having taken delivery of three important new types:—Comet, Viscount and Super Constellation, the first of which (left) arrived just in time to be exhibited.

"Flight" photograph

CIVIL AVIATION . . .

operations (Captain J. W. Bennett), has also three divisions—flight, engineering and operational planning.

It has also been announced that Mr. W. Hudson Fysh (soon to be knighted) has joined the board of B.C.P.A., whose shares are owned by three Commonwealth nations in the following proportions: Australia (50 per cent), New Zealand (30 per cent) and Great Britain (20 per cent). The other directors are Mr. G. P. N. Watt, Sir Keith Smith, Sir Leonard Isitt (N.Z.N.A.C.), Mr. E. L. Greensmith, Sir Miles Thomas and Mr. L. A. Hooke. General manager of the airline, which operates four DC-4s on the "Southern Cross" route from Sydney and Auckland to Vancouver and San Francisco, is Captain A. A. Barlow.

U.A.T. COMET MISHAP

ONE of the three Comets operated on African routes by Union Aèromaritime de Transport is temporarily out of commission after an accident on the ground at Dakar on June 25th. The aircraft apparently skidded on a wet surface and struck a wall, suffering a damaged undercarriage and wing. The crew of six and six passengers were unhurt.

TWO MINISTRIES IN ONE

OCTOBER 1st was given as the date for the planned amalgamation of the Ministries of Transport and Civil Aviation in a White Paper published last week by H.M. Stationery Office (price 2d). "The amalgamation of the two departments will make possible a limited measure of staff economies," the Paper states, "through the integration of common services such as establishments, accounts, and similar duties, all of which are now separately organized and controlled. There may be also scope for some small saving in accommodation."

The White Paper adds that "The main tasks of reviving U.K. civil aviation after the war and determining the main lines of its future . . . have now been carried to a stage when the subject no longer needs the undivided attention of a separate Minister." Nothing would be done to weaken links between the M.C.A. and the Ministry of Supply and the Air Ministry.

NEW RHODESIAN SERVICE

FORTNIGHTLY colonial coach services between the United Kingdom and Rhodesia were inaugurated by Hunting Air Transport Viking G-AGRP, which took off from Bovingdon on June 26th at 9 a.m. Scheduled time of its arrival at Salisbury Airport, having flown *via* Nice, Malta, Mersa Matruh, Wadi Halfa, Khartoum, Juba, Entebbe, Tabora, N'dola and Lusaka, was 3.55 p.m. (B.S.T.) on Monday, June 29th. The new service is operated jointly by Hunting Air Transport and Airwork, with each company flying a monthly service in each direction; the London terminal thus alternates between Bovingdon (Hunting) and Blackbushe (Airwork). The two companies have operated a similar service between London and Nairobi since June 6th, 1952. Colonial coach fares are, of course, lower than the first-class and tourist rate on each route. The London-Salisbury return fare, for example is £210 10s. compared with tourist and first-class fares of, respectively, £234 and £293 8s.

AUSTRALIAN TRAFFIC IN 1952

THE oft-repeated claim that Australians are the most air-minded people in the world is endorsed by the latest traffic figures issued by the Department of Civil Aviation. The number of fare-paying passengers carried on domestic services was 1,795,320, which represents nearly one in four of the total population of Australia. The general picture of both domestic and international operations formed by the statistics, however, shows a slight decline in traffic, which is attributed mainly to credit and import restrictions. In the table below, results achieved during the calendar year 1952 are compared with the previous year's traffic on a percentage basis.

	Domestic	Per cent change	International	Per cent change
Hours flown	256,471	−5.8	36,920	+6.2
Miles flown	41.5m	−4.6	8.4m	+5.2
Rev. passengers	1,795,320	−1.6	45,160	+7.3
Rev. load factor	64.1	−1.7	60.7	−1.7
Freight ton-miles	23.5m	−7.4	5.2m	+5.8
Mail ton-miles	1.1m	−11.5	4.8m	−3.2
Available seat-miles... ...	1,118m	+0.2	330m	+6.0

THE NEW INDIAN AIRLINES

WITH the return to India of Prime Minister Nehru (he has been in Britain for the Coronation), the formal inauguration of India's two new state airlines was due to take place on July 1st. Nationalization of Indian air transport took effect on June 15th, when the Air Corporations Bill was passed by Parliament. The structure of the Indian state airlines has been modelled on British practice and experience; despite opposition from some quarters, two independent lines have been set up to operate, respectively, international and domestic services.

Mr. J. R. D. Tata retains control of the long-haul airline which, in government-owned form, will continue to be known by the well-known name of Air India International. Mr. B. C. Muckerji, formerly managing director of the government firm of Sindhri Fertilizers, is named as the head of the regional company, which is to be known as Indian Airlines. Separate directorates consisting of both state-employed and private members nominated by the Indian government will control the two airlines.

An Indian correspondent reports that—with the exception of a few small cash payments—compensation will be in the form of 3½ per cent negotiable bonds which are guaranteed by the Indian government and which will be repaid at par after five years. The value of assets is calculated on the basis of original cost less depreciation at rates somewhat lower than the normal income-tax rates.

BREVITIES

AS expected, the Coronation attracted a record number of visitors to Britain, the total for May being almost 100,000, including 26,000 from America. About 36 per cent of all visitors arrived by air and the proportion of Americans who flew here was 41 per cent.

* * *

Conditions under which civil operators may use the United States Navy G.C.A. unit at Blackbushe are set out in *M.C.A. Information Circular* 72/1953.

* * *

A survey of German civil aviation shows that 60 per cent of traffic-control staff now employed there are Germans and that the proportion will be almost 100 per cent by the end of the year. About 75 per cent of all foreign aircraft operating in Germany are reported to be serviced by German airport staff. The number of passengers to fly to and from Western Germany this year is expected to be two million, compared with 1.6 million last year and 320,000 in Lufthansa's last operational year (1938-39).

* * *

Plans to develop Easter Island as an airport for a direct service between Australia and South America have been announced in Chile. Two Chilian experts have left to survey the island, which is 2,000 miles from the coast of Chile.

* * *

Sir Miles Thomas has been reported as saying that the 5s tax on passengers leaving British airports for overseas will probably be abolished in the autumn.

* * *

For an experimental period of three months Renfrew Airport is to operate on a 24-hour basis. Work on the new terminal building at Renfrew is proceeding to schedule and it is expected to be ready by May next year.

CIVIL-PILOT SCHOLARSHIPS

Proposal for a State-sponsored Training Scheme

IF the Government finds it necessary to sponsor the training of potential airline pilots, as many observers think it will, a great deal of planning will be necessary to ensure that the Corporations' and independent airlines' future requirements are met efficiently and economically. Few constructive suggestions have yet been advanced as to how this could be achieved. "Flight" is glad to put forward for consideration the views of one expert, Mr. I. L. S. McNicol, principal of the London School of Air Navigation, as he expressed them to us recently.

TRAINED flight crews might be said to form the soul of civil aviation, for without their skill and experience the airlines could make no progress. This experience has always been acquired at great expense over a long period, initially in the school of military aviation. Recent developments suggest that, in this country and many others, civil aviation cannot continue to rely on the Service over-spill to meet crewing requirements—particularly so far as pilots are concerned. Furthermore, the divergence between a Service and a civil flying career is growing wider.

The most efficient method of ensuring a supply of suitable pilots appears to be a scholarship or apprentice scheme underwritten by the State, in its role as the parent of our expanding civil aviation. There are precedents for such a plan in most other professions, and in this case the cost to the taxpayer would be small indeed in relation to the results—as I shall attempt to show.

The first step would be the formation of an organizing committee, small but representative of all the main interests concerned, with the Minister of Transport and Civil Aviation as its ex-officio chairman. Membership of the committee might be as follows: one representative from each of the two airways Corporations, one representative of the independent operators (through B.I.A.T.A.), a spokesman for each of the professional bodies (the Guild and the Association), a delegate from the civil training organizations and a representative from each side of the House of Commons (helping to ensure that the policy would stand in the event of a change of government). Before making its recommendations to the Government the committee would, of course, co-opt the advice of the Air Ministry and of any other authority which could assist in the main task of assessing the crew requirements of civil aviation from 1954 onwards and of deciding how they could best be met.

Committee members would have to bear in mind the gradual drying-up of the Service source, natural wastage of crews for medical and other reasons, the continuing expansion of both state and private airline operators and a certain amount of infiltration by pilots from the Commonwealth (though this might easily be balanced by emigration of British crews attracted abroad by higher salaries).

Since it would take at least six months to set up the scheme and another twelve to produce pilots holding their basic professional qualification, the committee would base their first estimate on the probable requirement for pilots around the end of next year. Candidates would be selected at the age of eighteen, and in view of their subsequent value in wartime should not be required to undergo the usual period of National Service. A short period of reserve training should be sufficient to instil the basic elements of Service discipline, methods and of *esprit de corps*. Obviously there would be no shortage of likely candidates, and in making their selection the committee could enforce high physical, mental and educational standards. By stipulating that candidates should hold a private pilot's licence it would be possible to keep preliminary wastage at a very low level. Obtaining this licence either through the A.T.C. or at his own expense, the applicant could prove that he possessed at least part of the ability and enthusiasm essential to a civil pilot's career. An important advantage of the scheme would be to eliminate, so far as is possible, risks of unemployment among commercial pilots. Many parents would then entertain the idea of sponsoring a son's entry into the civil flying profession.

Written tests would provide the selection committee with a short list of about 50 per cent more applicants than the number of pilots required for the first year—which, at a guess, might amount to 200. Successful candidates would then be allocated to professional training organizations on a contractual basis. Experience shows that this would be far more efficient and economical than setting up a lavish State training organization. The pre-war Imperial Airways training system and the post-war corporation counterparts, though admirable in concept, produce disappointing results in relation to the costs involved.

At a cost of up to £1,500-£2,000 per man, it should be possible in twelve months to provide the pupil with his commercial pilot's licence with instrument rating. When converted to small twin-engined types and qualified to take up their first professional posts as supernumerary first officers, pilots would then be fed into a pool from which the operator could draw his recruits.

The cost of training should be regarded as a loan rather than a grant to the apprentice pilot. As soon as the graduate's earnings reached a sufficiently high level, he would begin to reimburse the State training fund; in practice, the payments would be made by the employer, who would keep back a proportion of his salary for this purpose. In view of the high salary which the State-trained first officer could earn at the age of 20 or 21, such an arrangement seems both fair and wholly practical. Inevitably there would be a small percentage of wastage both before and after graduation; and this is the only financial risk which the State would be called upon to take.

The training syllabus would consist of a minimum of 200 hours flying, coupled with a comprehensive programme of ground instruction embracing the academic, technical and synthetic features. Three-quarters of the student's flying would be on light single-engined types in which he would become fully conversant with aerobatic, night, instrument and cross-country flying. There seems no reason why he should not spend the first two or three months of his course at a flying club provided that the club could satisfy the M.C.A. that it was fully capable of giving basic pilot-navigator training. Such a step would serve the dual purpose of keeping down the cost of the training scheme and of giving a needed fillip to the club movement, which should be considered as the cradle of civil aviation.

At the end of this brief period of intensive flying the student would have 80 to 100 hours experience, and his proficiency, purely from a flying viewpoint, would approximate to the R.A.F. "wings" standard. Further single-engined time would be combined with advanced academic and professional training at a suitably qualified school. The final part of the course would consist of 50 hours' conversion training, on a twin-engined type, such as the Consul, together with applied training in asymmetric flying, emergency and traffic procedures, advanced instrument practices, navigational aids, and airways flying. If such an aircraft as the Dove were used for advanced training the costs would be greater. Further work in the classroom would precede the M.C.A.'s written examination and flight test for the commercial pilot's licence, instrument rating and R/T. qualification.

With the necessary licences in his pocket, the graduate pilot would now be ready for employment in a productive capacity. Initially, of course, he would fly only as a supernumerary first officer and additional company training would be essential. For the operator, it need not be unduly difficult or expensive to provide the junior pilot with experience of routes, procedures and conversion training on airliner types. If necessary, a period of ground service in operational departments would help to instil an intelligent appreciation of the commercial pilot's task.

Such experience, however, cannot replace cockpit training, which is the only means of producing a competent and responsible captain. The mercantile marine system of training has given this country a position on the sea-lanes of the world which has never been surpassed. If British civil aviation follows a similar course this will be true also of the world's airways.

SAUNDERS-ROE APPOINTMENT . . .

ON July 13th Mr. Hugh Gordon takes up a new appointment with Saunders-Roe, Ltd., as manager of their helicopter division at Eastleigh. Mr. Gordon, who is 41, began his aviation career in 1929 as an apprentice with Short Bros. at Rochester, later appointments including those of assistant test pilot and manager of repairs and servicing. In 1946 he joined B.E.A., becoming chief maintenance engineer the following year and deputy to the chief engineer in 1951.

. . . AND NEWS OF THE PRINCESS

ANOTHER Saunders-Roe announcement says that the Princess flying-boat made a long-range flight on Monday over Britain, Northern Ireland and the French coast at an all-up weight of 140 tons. The captain, Mr. Geoffrey Tyson, was accompanied by a crew of 12.

CRANFIELD PRESENTATION DAY

Distinguished Speakers at College of Aeronautics Ceremony

PRESENTATION DAY at Cranfield on Friday last, June 26th, marked the graduation of the sixth two-year diploma course. As has become the custom, the presentation ceremony in the morning was followed by informal tours of inspection of the various departments by guests of the college and of the students in the afternoon, and by the Presentation Ball, organized by the Students' Society, in the evening.

At the beginning of the presentation ceremony, the chairman of the board of governors, Sir Edgar Ludlow-Hewitt, made the announcement—a surprise to many present—that he was retiring on that occasion from this appointment, which would be taken over by Sir Frederick Handley Page. Tracing the history of the college during his period as chairman of the board, Sir Edgar went on to pay tributes to the early work of Mr. Relf (the first principal), Professor Duncan and Professor Lickley, in the days when the college, set up to serve industry, was in fact not recognized by industry.

Concerning the allegedly high figure obtained when the total cost of Cranfield was divided by the number of students resident, Sir Edgar mentioned the alternatives of reducing the college property or increasing the number of students. The former was not a good thing; "The destiny of this college is great enough to merit every building here." Concerning the staff, he continued, the governors were aware of the importance of having a staff adequate to the college's very big responsibilities. No lowering of the standard of teaching would be tolerated; both academic and practical engineering men were needed. The relative numbers of the teaching staff were high, but if industry wanted Cranfield students, Sir Edgar concluded, industry itself must do something about providing the teachers that were needed.

The report of the principal, Sir Victor Goddard, for the year began with references to both the retiring and the new chairman. "Sir Edgar was, and still is, essentially a courageous man of the air, essentially a disciplined man of applied science, essentially a far-sighted pioneer . . . I hope that he will, year by year, learn that the men who have been trained here are increasingly achieving the high purpose of this, his own enterprise, and perhaps his crowning work for the country."

"Sir Frederick has been a devoted advocate of technical schooling for the air. He is the founder and head of his own apprentice school. He is the chairman of the City and Guilds Institute of London . . . chairman of the governors of the R.A.E. Technical College . . . a governor of the Imperial College of Science and Technology . . . We look forward to service for this college with Sir Frederick with keen anticipation and we must congratulate the college that a man of Sir Frederick's world renown in the field of aeronautical achievement is now at the head of its affairs."

Sir Victor went on to refer to the guests, who included Sir Lionel Whitby (vice-chancellor of Cambridge University), Dr. H. L. Haslegrave (principal of Loughborough College), Air Commodore H. D. Spreckley (commandant of the R.A.F. Technical College, Henlow), Dr. H. H. Burness (assistant secretary to the Ministry of Education), and "the chief-executive directors of two firms whose world reputations in their own fields are unexcelled," Lord Hives (Rolls-Royce) and Mr. W. E. Nixon (de Havilland Aircraft).

Mentioning intra-mural developments and changes, the principal stated, "The Work Study School, integral with the college yet acting as a separate entity, is an experiment on which Professor Connolly and his staff deserve special praise, interest, and success." Many people had learned more about the college during the year, either by means of the sound and television broadcasts or by personal visits: "From the public, about three thousand people have visited the college. One visit, above all others—and there have been many by leading men such as our guests today—we loyally and sincerely welcomed was that by the Duke of Edinburgh. He clearly appreciated what we are doing and seeking to do.

"Research development and flying contracts in this past year have totalled about £60,000 . . . A continuation (is forecast) of recent flight research work on the boundary layer on swept-back wings . . . which has excited the interest of the Aeronautical Research Council . . . The completion of two important new wind tunnels, supersonic and subsonic, is another aspect of our mounting research contribution.

"During the year, thirteen reports on original work of importance in aeronautical engineering and science have been considered worthy of publication and world-wide circulation."

One new development, Sir Victor continued, concerned liaison between the college and industry: "With the agreement of the governors, the S.B.A.C. has appointed an advisory panel of prominent aeronautical engineers to study the mutual requirements of the industry and the college . . . the chairman is Mr. H. H. Gardner, chief designer in the Guided Missiles Department of Vickers Armstrongs." Apart from the full-course students, who were employed in the aircraft industry, government science, the armed forces and aviation generally, nearly nine hundred professional men, mainly from the aircraft industry, had passed through specialist short courses at Cranfield.

After discussing the results of the sixth diploma course, the principal turned from facts to the continuing aim of the college: "In most creative fields, advances in technique cannot be achieved by untrained minds, or by uninspired minds. We have to seek for capabilities which can be trained to technology, and we may find the right men among those who have shown either practical ability or academic ability. The task is then to give them the environment, the means, the leadership and the disciplines which will develop those all-round qualities of curiosity, of understanding, of insight and of creative urge, in the hope that experience in their chosen field of endeavour will cause them to contribute some new and better means of achieving what is required.

"While many eminent men have been talking and writing about what needs to be done for the training of technologists, this College of Aeronautics has, by tackling the problem in a practical and far-sighted way, established a system which is producing results. Here you have the blending of the practical and the academic in the training of men from industry, men from the Services and men from the universities; training them to become technicians with insight; trusting to give them thereby the best prospect of evolving into technologists . . ."

To the students going down, the principal said:—

"The aim of this college is not to produce specialists but rounded and competent beginners in creative engineering. Specialization is a necessary phase: it is a necessary means of inducing careful and penetrating thought. But some who have specialized latterly in one subject here may later find their best bent in another line.

"I am confident that the training in self-reliance and inquiry which you have had, or are having, will lead you to find ways of making new and necessary achievements possible in time and, meanwhile, to serve those to whom your service and loyalty are due. And I hope that the way you do that will encourage others to believe that this college merits their allegiance, too."

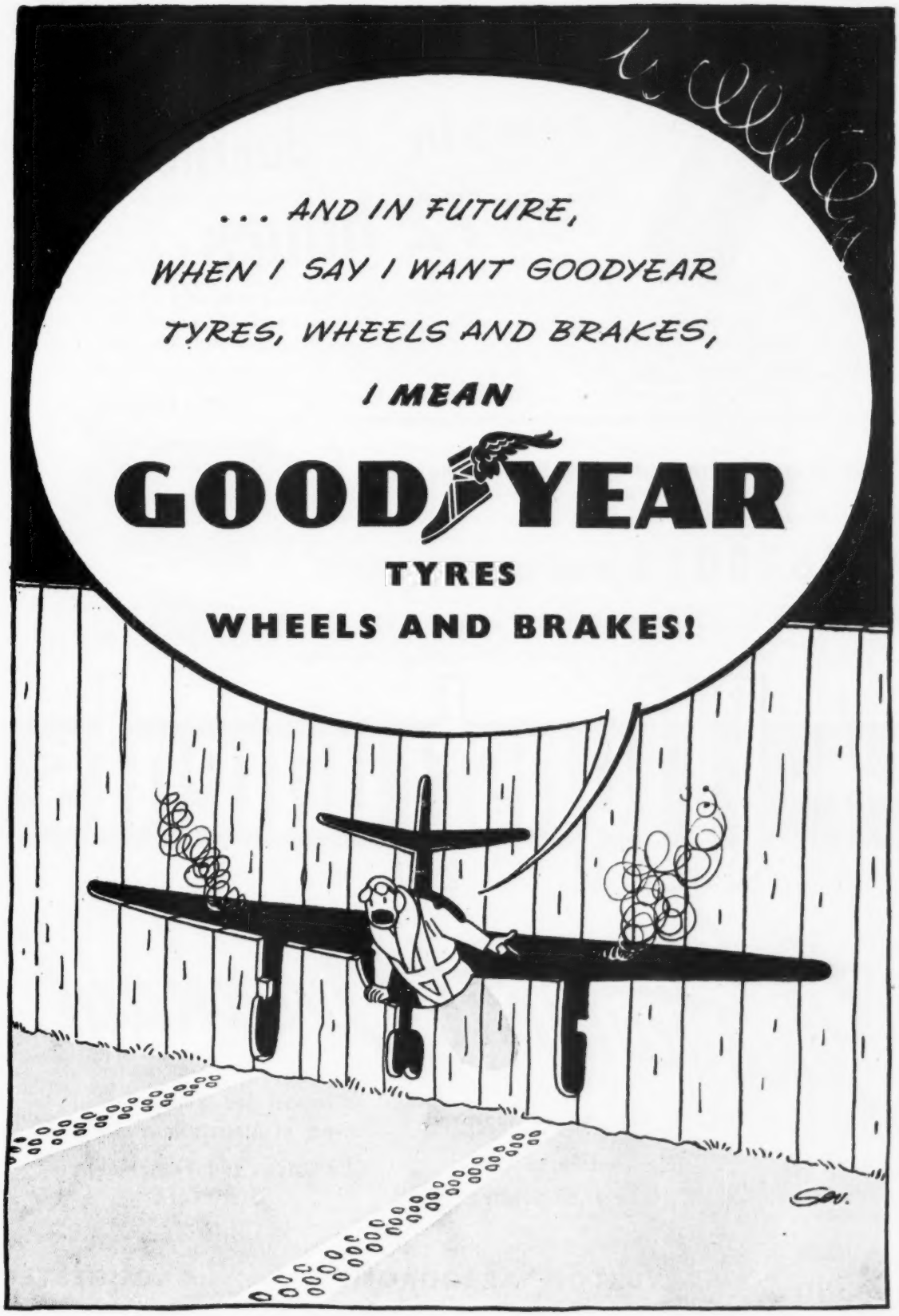
The presentation of diplomas and prizes was made by Lord Hives, C.H., M.B.E., B.Sc., F.R.Ae.S., who then spoke of the way in which, from his own point of view, Cranfield graduates could best fit in to the pattern of industry. It was dangerous to assume that the British aircraft industry was years ahead of its competitors, he continued, but there was no reason why our present lead should not be retained, provided this country's high standards were maintained in the future.

The following students received awards:

Diploma with Distinction: B. S. Campion, B. Dickinson, M. L. Henney, J. B. Russell (Aerodynamics); G. M. Coiley, A. W. Culmer, H. F. W. Naylor (Aircraft Design); P. Cadman, P. M. Rippon (Aircraft Propulsion); J. F. H. Goddard (Aircraft Economics and Production). *Diploma:* R. G. Austin, D. J. Carey, T. G. Doe, P. G. Hutton, R. E. Keates, D. M. Lawrence, W. Socha, J. E. Talbot, J. R. Wedderspoon (Aerodynamics); A. T. Binding, A. Cooke, A. E. A. Dudman, J. G. Price, R. W. Prizeman, D. A. Sharp (Aircraft Design); A. G. Allen, T. J. Croysdale, J. Gallichan, J. Graham, M. H. Hall, J. R. Tyler (Aircraft Propulsion); F. H. Chaffer, D. L. Coveney, J. P. Dainty, F. T. Dent, E. Fell, S. Hinchliff, K. C. Krishnan, W. J. Paul, C. H. Steen, J. Wastling, A. Wilding, V. Willis, R. G. Wilson, R. E. Yapp (Aircraft Economics and Production); D. J. Mayes, M. A. Perry (Aircraft Electrical Engineering). *Certificate for One-Year Advanced Course:* W. B. McCarter, S. Radhakrishnan (Aerodynamics).

The Governors' Prize for the best overall performance was won by F/L A. W. Culmer, and the Principal's Prizes for the best 2nd-year original work went to Mr. B. S. Campion and F/L P. Cadman.

In the evening, students, former students and guests made their way to the Senior Common Room building, and the special marquee, where the 1953 Presentation Ball was to be held. The third large-scale function of its kind, the ball proved well up to the high standard of the previous two, due in full measure to the efforts of the students themselves. The excellent food, wine, music, company and decor, together provided the perfect atmosphere for the final thoroughly enjoyable evening so well deserved after two years at Cranfield. K.T.O.



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SERVICE AVIATION

Royal Air Force and Fleet Air Arm News

The Queen's Review

THE following details concerning Her Majesty the Queen's Coronation Review of the Royal Air Force, to take place at Odiham, Hants, on July 15th, have been released. It will be the occasion for the biggest parade of aircraft on the ground and in the air, ever mounted in the history of the Service.

On the ground, marshalled in four parallel lines each stretching for more than three-quarters of a mile, will be 318 aircraft, representing all Commands of the R.A.F. at home, the 2nd Tactical Air Force in Germany, and the Royal Canadian, Royal Australian and Royal New Zealand Air Forces. There will also be a parade of vehicles and equipment from the various ground branches of the R.A.F. and its auxiliary and reserve elements.

In the air there will be a fly-past by 639 aircraft, ranging from basic trainers flying at 98 m.p.h. to the latest swept-wing supersonic fighters now in production for the R.A.F., flying at 665 m.p.h. Prototypes of the new "V"-class four-jet bombers, the Valiant, Vulcan and Victor, and the Javelin all-weather fighter will also be included. The aircraft will take off from 42 different airfields and fly to a point near Leavesden, Herts, then continue over a 40-mile corridor to Odiham.

This will be the second Royal Review in the history of the Royal Air Force. The first, commemorating the Silver Jubilee of King George V, took place at Mildenhall and Duxford on July 6th 1935, when 356 aircraft were paraded on the ground at Mildenhall.

Navy Day at Bramcote

THE Navy Day at R.N. Air Station Bramcote (H.M.S. *Gamecock*) on Saturday, June 27th, was a very successful day for both the public and the organizers.

The naval review which preceded the air display was held during the morning before an invited audience, the members of which included the civic heads of Birmingham, Leicester, Nuneaton and Coventry. The reviewing officer was Admiral of the Fleet Sir Rhoderick McGrigor, G.C.B., D.S.O., who was accompanied by Flag Officer Ground Training, Rear Admiral A. D. Torlesse, C.B., D.S.O., and the commanding officer of H.M.S. *Gamecock* Capt. N. S. Henderson, O.B.E., R.N.

The afternoon began with a stream of cars lining the roads to the camp, and thousands of visitors moving along to the airfield entrance. Static exhibitions included items of interest from the air engineering, electrical, safety equipment, meteorological and armament branches. In addition, the general service branch was well represented with diving equipment, depth charges, magnetic mines, model warships and a special item for the schoolboys—the control panel of a destroyer engine room.

Side shows included an Oerliken gun turret mounting, whence visitors were invited to try their hand at 6d. a burst.

GAMECOCK GYRATIONS: A naval Westland Sikorsky S-55 is put through its paces for the benefit of an appreciative crowd at Bramcote during the stations' Navy Day last Saturday.

The R.C.A.F. Pipe Band gave an impressive display before the first event, that of a combined fly past of R.N.V.R. squadrons of Seafires, Fireflies and Sea Furies from Bramcote, Ford and Stretton respectively. This was followed by a demonstration of Air/Sea Rescue by a Dragonfly from the helicopter squadron at H.M.S. *Siskin*, Gosport.

The antics of Lt. Sinclair R.N., and Sgt. Banel from R.A.F. Syerston, playing the parts of pilot and pupil in two Percival Prentice aircraft caused considerable amusement, especially the very effective stalls by the pupil. This was followed by a glider display lasting about five minutes, Lt-Cdr. Trelawney R.N., giving an excellent commentary on the technique involved.

Lt. Woodhead, R.N.V.R. (1833), then gave a stimulating display of acrobatics with his Seafire 47, a performance which was followed by the parachute jumping demonstration given by the 18th (Warwick) Battalion, the Parachute Regiment, Territorial Army.

No. 1833 Squadron's rocket assisted take-off set in motion a stream take-off by all the aircraft taking part in the display, including a Sea Prince. The helicopters added to their previous sparkling performance with a flying display that gave onlookers the impression of a rhumba demonstration, followed by an air-to-ground rescue, in which two "policemen" were landed, complete with cycles, from one helicopter while the remaining helicopters were harassing what appeared to be an escaped prisoner.

The act finished much to the crowd's amusement by the policemen being harassed by the helicopter while clutching the escapee's trousers—the prisoner making an undignified exit in the remaining helicopter.

The final item, a combined attack on the airfield by fighter aircraft in support of infantry and Bren-gun carriers of the 7th Territorial Army Battalion, the Royal Warwickshire Regiment, ended the programme and those visitors who did not take advantage of the 5s pleasure flights, contented themselves with inspecting the remainder of the static displays.

NAVAL OCCASION: The reviewing officer at Bramcote naval review, Admiral of the Fleet Sir Rhoderick McGrigor, G.C.B., D.S.O., First Sea Lord, pauses during his inspection for a word with a Wren drummer.

Pilot for Royal Tour

THE pilot selected to fly the Queen and the Duke of Edinburgh on their Australasian tour next year is S/L. J. G. Cornish, R.A.A.F., who is to spend some two months in Britain studying procedures for such V.I.P. flights.

It is expected that he will be at the controls for 28 of the 35 royal flights to be made in Australia. The aircraft used will be a Dakota belonging to the Royal Australian Air Force.

Air Direction Frigate

ON Thursday, June 25th, Lady Mansergh, wife of Admiral Sir Maurice J. Mansergh, C.-in-C., Plymouth, performed the naming ceremony at the launching of H.M.S. *Salisbury*, the first of a new type of air direction frigate. The new ship is 340ft overall, with a beam of 40ft. Main armament consists of two 4.5in and two smaller guns.

When introducing the Navy estimates for 1952-53, the First Lord of the Admiralty (The Rt. Hon. J. P. L. Thomas, M.P.) stated that the new frigates are of four types—two types for anti-submarine work,

SERVICE AVIATION . . .

a third for anti-aircraft and a fourth for aircraft direction. "Honourable Members," he continued, "may wonder why it has not been possible to produce an all-purpose vessel. The answer is that modern equipment is now so great that it will not go into one vessel of a reasonable size. No one ship, therefore, can carry all, but at the same time each type can do some of the work of the other types."

An air direction ship is in effect a floating air-operations room.

The Runnymede Memorial

THE following appreciation of the Runnymede memorial to the airmen of the Commonwealth "who lost their lives and who have no known grave" comes from one (to quote his covering letter) whose flying days "ended 25 years ago and my nephew is among those whose names will be recorded within the memorial."

"Out on the brow of the hill which overlooks historic Runnymede, they are building a memorial to over twenty thousand airmen of the Commonwealth who have no known grave. A more appropriate site could hardly have been chosen, for they sprang from stock which has never taken kindly to the ways of tyrants, whether Norman or Teuton.

"The memorial is simple and straightforward. Devoid of frills, it is starkly functional and, in many ways, mindful of an aerodrome building. It is an architectural understatement that would surely have met with the approval of the lovers of understatement it serves to commemorate.

"Within its cloisters will be recorded the names of those whose last landings were never entered in the log-books. Here they will be inscribed, not on the paper which yellows and crumbles with the years, but on stone that endures and is the log-book of history.

"And let us not brood unduly over the words, 'no known grave.' Those who fly are not given to worrying overmuch about such matters. For them the end may come in many ways and what happens afterwards is of comparatively small concern.

"Their memorial looks out over the green fields and trees that is England. Above and around it is the sky which they fought to keep clean. It is possible, if you have the time and the memory, to stand there and still hear their Spits and Hurries, their Wimpies and Lancs, and all that great company of planes in which they, to use Stephen Spender's words, 'travelled a short while towards the sun and left the vivid air signed with their honour.'

"For the greatest achievement of this memorial is its atmosphere. It belongs to the air . . . like those whose memory it enshrines.—F.E.C."

"Flight" photograph

SUPERSONIC TONIC: Now that sufficient spares backing is available, Sabre squadrons of the Royal Air Force are forming fast. This Sabre F.4 was photographed in Germany, complete in camouflage and squadron markings.

Field Service Cap Obsolescent

AS from August 1st the field service cap will go out of existence in the R.A.F. generally, although there will be a link with tradition at the R.A.F. College, Cranwell, and the R.A.F. Technical College, Henlow, where flight and technical cadets will retain the privilege of wearing the warrant officer pattern of this form of head gear.

It will, however, no longer be worn by R.A.F. Apprentices, Boy Entrants or members of the Air Training Corps or by airmen and airwomen of the Regular, Auxiliary or Reserve air forces. Berets are now worn instead of field service caps for day to day wear by officers and airmen. An improved type of peaked cap was recently introduced for airmen for ceremonial and walking-out occasions.

As from August 1st, also, a miniature type of warrant officer badge will be worn on berets by R.A.F. and W.R.A.F. warran. officers of the Regular, Auxiliary and Reserve forces in place of the eagle and crown cap badges now worn.

Air Force List

THE 1953 unrestricted edition of the Air Force List, now on sale at H.M. Stationery Office, contains certain innovations which add to its value as a work of reference.

In addition to giving the heads of the main branches of the Air Ministry and Command Headquarters and the gradation lists for active officers of the R.A.F., the Royal Auxiliary Air Force and the R.A.F. Volunteer Reserve, the list now records the names of retired officers in a section to itself and under a separate index.

Another innovation is the introduction of a symbol, a small square, which, placed after medals or decorations for gallantry shown against officers' names, denotes the award of a bar to such medals or decorations.

The list also contains the names of British air attachés abroad, the staffs of the United Kingdom headquarters of Commonwealth air forces and the Royal Air Force elements in Europe. The list costs 18s. 6d.

FAR EAST FURIES: (Left) A Hawker Sea Fury of No. 807 Squadron, F.A.A. (Lt-Cdr. T. L. M. Brander, D.S.O.) making a rocket-assisted take-off from H.M.S. "Ocean" while the ship was moored in Sasebo harbour, Japan. The whole squadron, for the first time, was launched from the stationary carrier. (Right) One of No. 801 Squadron's Sea Furies, from H.M.S. "Glory," attacking enemy headquarters in Korea.

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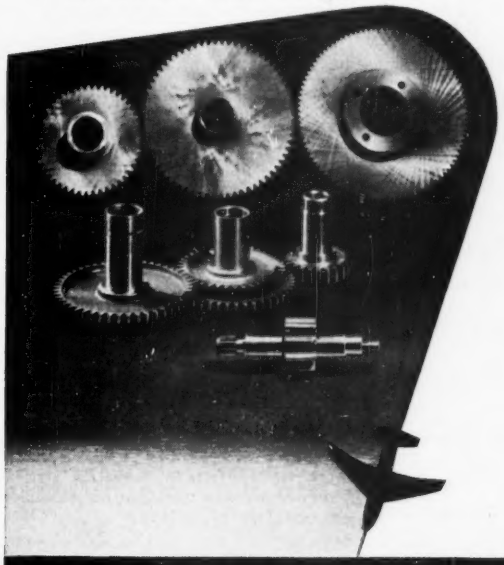

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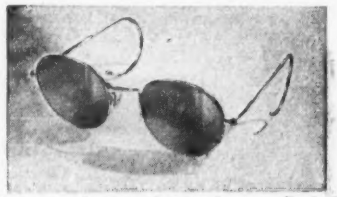

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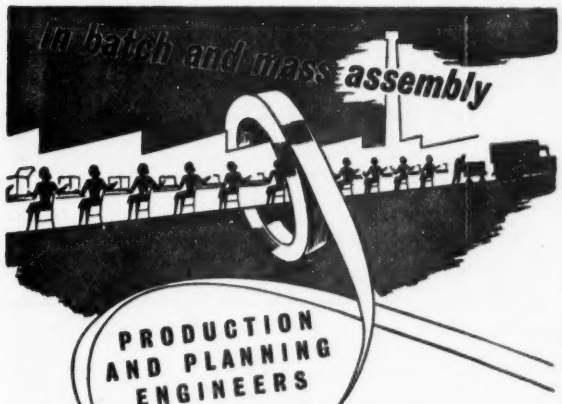

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INDEX TO ADVERTISERS

	Page
Adcola Products, Ltd.	26
Aerocontacts, Ltd.	27
Airscrew Co., and Jicwood, Ltd., The	25
Aviation Traders, Ltd.	2
Boulton Paul Aircraft, Ltd.	7
Bristol Aeroplane Co., Ltd., The	Cover iv
British Air Line Pilots' Association, The	30
British Emulsifiers, Ltd.	8
British European Airways	20
British Institute of Engineering Technology	30
British Insulated Callender's Cables, Ltd.	Cover ii
Coley Metal, Ltd.	32
Cross Manufacturing (1938), Ltd.	30
De Havilland Aircraft Co., Ltd., The	Cover i
De Havilland Engine Co., Ltd., The	30
Dowty Equipment, Ltd.	29
English Electric Co., Ltd., The	21, 30
Fairey Aviation Co., Ltd., The	15
Field Aircraft Services, Ltd.	28
Fishers	31
Flight Refuelling, Ltd.	32
Fokker	22
Gloster Aircraft Co., Ltd.	11
Goodyear Tyre and Rubber Co. (Great Britain), Ltd., The	23
Gosheron and Co., Ltd., John	31
Helliwells, Ltd.	8
Henlys, Ltd.	29
Lewis, Ltd., D.	26
Martin-Baker Aircraft, Ltd.	16
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Opperman, Ltd., S. E.	25
Peto and Radford, Ltd.	Cover iii
Pressed Steel Co., Ltd.	24
Riley, Ltd., Robert	25
Roe and Co., Ltd., A. V.	10
Rollason, Ltd., W. A.	26
Rolls-Royce, Ltd.	19
Rozalex, Ltd.	30
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Saunders Valve Co., Ltd.	2
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Short Brothers and Harland, Ltd.	5, 28, 29
Société Nationale de Constructions Aeronautiques du Sud-Ouest	6
Staravia	26
Sugg and Co., Ltd., William	31
Teddington Controls, Ltd.	4
Terry and Sons, Ltd., Herbert	1
Thermionic Products, Ltd.	9
Troup, Curtis & Co., Ltd.	26
Vandervell Products, Ltd.	18
Vernons Industries, Ltd.	3
Westway Models, Ltd.	9
Whitehouse Industries, Ltd.	12
Wynstruments, Ltd.	24

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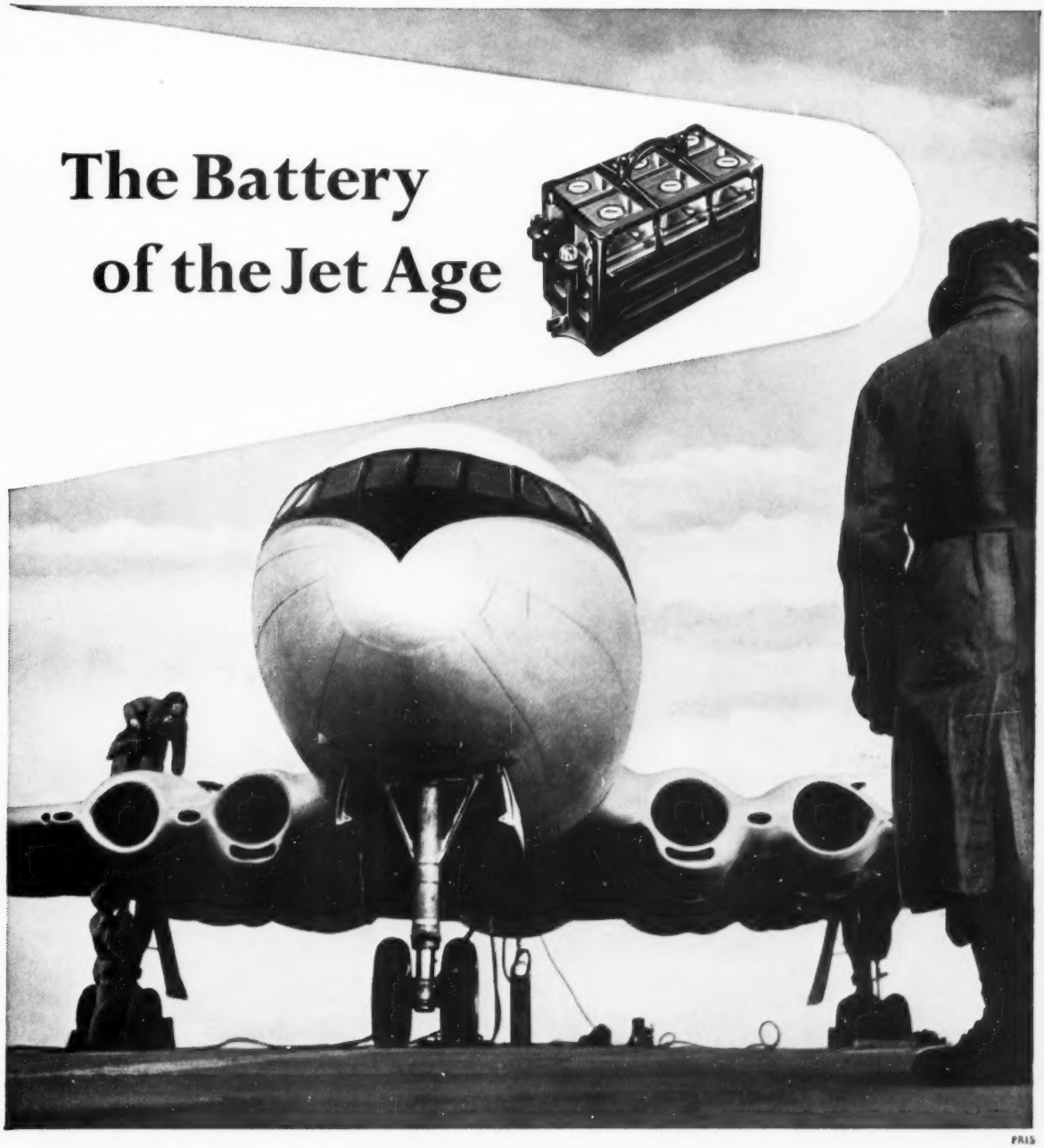

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